February 1949

50 cents per copy
$4.00 per year

EDUCATION

VOLUME 69 No. 6

ARITHMETIC NUMBER

Functional Problem Units in Arithmetic
A First Grade Reports On Its Plant Sale
Christmas Arithmetic
Grocery Store: A Problem Unit
The Children's Grocery Store: A Problem Unit
Rummage Sale: A Problem Unit
Our Bundle of Friendship: A Problem Unit
A Bird Feeding Station
Dragging—A Problem Unit
A Healthy Breakfast—A Functional Problem Unit
Sketches of Functional Problem Units
Thrift
Functional Mathematics in High School
Discovering Problem Unit Readiness
They're Never Too Young
The Preparation Needed by Teachers of Arithmetic
The Place of Drill in Learning Theory
Metric, A Post-War Aid?

A MAGAZINE DEVOTED *to the* SCIENCE, ART, PHILOSOPHY *and* LITERATURE *of* EDUCATION

EDUCATION

Managing Editor
RAYMOND P. PALMER

Book Review Editor
WILLIAM P. SEARS, JR.

Editorials
CARL G. MILLER

ASSOCIATE EDITORS FOR 1948-49

SEPTEMBER . . . . . *GEOGRAPHY*
OTIS W. FREEMAN, Professor of Geography and Head of the Department of Physical Sciences, Eastern Washington College of Education, Cheney, Washington

OCTOBER . . . . . *MODERN LANGUAGES*
STEPHEN A. FREEMAN, Vice President of Middlebury College, Middlebury, Vermont

NOVEMBER . . . . . *POSTWAR PROBLEMS*
JESSE S. ROBINSON, Professor of Economics, Carleton College, Northfield, Minnesota

DECEMBER . . . . . *PUBLIC RELATIONS*
PAUL J. MISNER, Superintendent of Schools, Glencoe, Illinois

JANUARY . . . . . *MENTAL HYGIENE*
LOUIS P. THORPE, Professor of Education and Psychology, University of Southern California, Los Angeles, California

FEBRUARY . . . . . *ARITHMETIC*
GUY M. WILSON, Professor Emeritus, Boston University, Boston, Massachusetts

MARCH . . . . . *MUSIC*
LLOYD F. SUNDERMAN, Arthur Jordon Conservatory of Music, Indianapolis, Indiana

APRIL . . . . . *INDUSTRIAL EDUCATION*
C. KENNETH BEACH, Professor of Industrial Education, New York State School of Industrial and Labor Relations, Cornell University, Ithaca, New York

MAY . . . . . *READING*
EMMETT A. BETTS, Director of The Reading Clinic, Temple University, Philadelphia, Pennsylvania

Newcomb & Gauss Co., Printers, Salem, Mass.

EDUCATION

A MONTHLY MAGAZINE

DEVOTED TO THE SCIENCE, ART, PHILOSOPHY AND LITERATURE OF EDUCATION

VOL. 69 FEBRUARY, 1949 No. 6

ARITHMETIC
FUNCTIONAL PROBLEM UNIT NUMBER

Edited by

GUY M. WILSON, Professor Emeritus, Boston University

ALTON E. RAMEY, Supt. of Schools, Provincetown, Mass.

Contents

		PAGE
Functional Problem Units in Arithmetic	*Guy M. Wilson*	327
A First Grade Reports on Its Plant Sale	*Gertrude M. Rogers*	332
Christmas Arithmetic	*Mrs. Mary Eldredge*	334
Grocery Store: A Problem Unit	*Helen M. Sylvia*	337
"The Children's Grocery Store": A Problem Unit	*Vesta L. Gould*	340
Rummage Sale: A Problem Unit	*Helen L. Hilcken*	343
"Our Bundle of Friendship": A Problem Unit	*Della L. Macomber*	347
A Bird Feeding Station	*Mrs. Emma Holway*	349
Dragging: A Problem Unit	*Ethel F. Collinson*	351
A Healthy Breakfast: A Functional Problem Unit	*Mary Ellis*	355
Sketches of Functional Problem Units	*Mary A. Shea*	357
"Thrift"	*Otto E. Nickerson*	360
Functional Mathematics in High School	*E. J. Dahill*	362
Discovering Problem Unit Readiness	*Elizabeth Ray and Guy M. Wilson*	367
They're Never Too Young	*Herbert S. Zimm*	369
The Preparation Needed by Teachers of Arithmetic	*Gertrude Cushing Yorke*	373
The Place of Drill in Learning Theory	*B. R. Buckingham*	376
Metric, A Post-War Aid?	*G. Harold Billingham*	383
Editorial:—UNESCO and Educational Vagueness	*Carl G. Miller*	386
Book Reviews		387

Published Monthly Except July and August
Subscription Price: $4.00 per year, 50 cts. per copy
Entered as Second Class matter at the Post Office, Boston, Mass., under the Act of March 3, 1879

THE PALMER COMPANY, Publishers

370 Atlantic Avenue Boston 10, Massachusetts

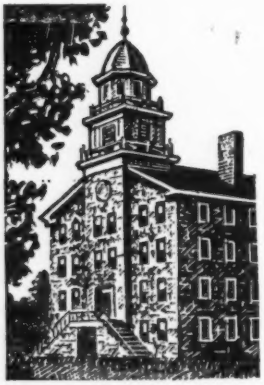
MIDDLEBURY COLLEGE

Summer

LANGUAGE SCHOOLS

MIDDLEBURY, VT.

JULY 1 — AUGUST 18



FRENCH • GERMAN • ITALIAN

SPANISH • RUSSIAN

Acquire a real mastery of a foreign language both spoken and written. Obtain a thorough understanding of the country's institutions, literature and culture through the famous method of segregation and concentration pioneered 34 years ago by Middlebury College. Effective teacher training, or preparation for international service. Graduate courses taught by native teachers with foreign and American university experience.

Pledge yourself to use *no English* for seven weeks Earn a Master's degree or a Doctorate, while enjoying the beauty of the Champlain valley in the foothills of the Green Mountains.

For complete bulletin and other information, write:

Office of the SUMMER SCHOOLS
MIDDLEBURY COLLEGE, Middlebury 5, Vt.

Just Published

DANGEROUS TRENDS

How Undercurrents Economic and Political Affect Education

196 pp., red silk cloth, $2.00

31st Edition

HANDBOOK OF PRIVATE SCHOOLS

1024pp., red silk cloth, $8.00

Still Available

"MAD OR MUDDLED," 196 pp., red silk cloth, $2.00; "THE CONTINUING BATTLE FOR THE CONTROL OF THE MIND OF YOUTH," 168 pp. red silk cloth, $1.50; "THE FUTURE OF EDUCATION," 236 pp., red silk cloth, $2.00; "WAR AND EDUCATION," 512 pp., black vellum, $4.00; "BETWEEN TWO WARS—The Failure of Education, 1920-1940," 616 pp., black morocco cloth, $5.00.

Circulars and Table of Contents of these and other current volumes on request

PORTER SARGENT

11 Beacon Street Boston 8, Mass.

THE WILSON

INVENTORY AND DIAGNOSTIC TESTS IN ARITHMETIC

By GUY M. WILSON, Ph.D.

The primary purpose of the Wilson Process Tests is to improve teaching.

These tests help the teacher and the pupil by locating the specific causes of process difficulties.

The check scheme teaches the child how to locate his own difficulties.

Teachers who have been using these tests co-operatively have been surprised: first, to note the number of children making mistakes, even in the upper grades; second, to note the interest of the children when the tests were used carefully according to directions; and third, to see the rapidity of improvement among the children when testing is followed by needed teaching.

The series consists of the following process step difficulties tests:

Addition—Subtraction Multiplication—Short Division—Long Division—Addition, Related Decade Facts to 39+9

PRICES:

Tests, any assortment.....$1.00 per hundred
Teacher's Direction Sheet and Manual.....$ .10
Specimen set of one of each of the tests and the Manual.....$ .25

THE PALMER COMPANY

370 Atlantic Avenue Boston 10, Mass.

EDUCATION

Vol. 69 FEBRUARY 1949 No. 6

Functional Problem Units *in* Arithmetic

By GUY M. WILSON
Boston University

ISOLATED textbook problems in arithmetic are being discarded by better teachers; they are being replaced by functional problem units based upon child contacts with home and community. Good problem units make of arithmetic the thing it was really meant to be, a useful tool in business,—the business of living as required by the family budget, and the business of making a living through appropriate employment. And it so happens that such work provides the best basis for understanding and general values, if these are the ends sought by a particular teacher.

In textbooks, problems are "made up" to illustrate processes, and properly try the patience of pupils according to their maturity. But in life problems are real and relate to something that the individual wishes to accomplish; he does not buy handkerchiefs at a price to illustrate a particular table in multiplication, nor does he buy anything else that way,—a pair of shoes, a suit, a bag of peanuts. Most problems in life involve money, —earning, spending, saving, investing.

Few people realize how foolish are most of the problems in arithmetic texts, and how devoid of meaning to children, even to adults, for that matter.

I open the pages of a sixth grade text and leaf through to find written poblems. The title of the series may include "New Standard," "Real Life," "New Curriculum" or some other appealing expression, suggesting social utility. But what do I find? Page 96,

"8. Mrs. Hunt uses 9 lbs. of sugar, canning 3/5 of her berries. How many pounds will it take to can all of her berries?"

There is nothing here that is real and no housewife would stop to figure this way when 3/5 of her berries were canned. The important thing is the right proportions of sugar and berries. She consults her recipe for the right proportions; then she weighs the berries, figures the amount of sugar, and weighs that.

The problem as it reads is not a real problem; it is merely drill, and might as well read, "If 3/5 of a number equals 9, what does 5/5 equal?" The experience of actually canning

berries would bring meaning to the children.

On page 81 of this same text, problem 5 and 6 read: "(5) There were 10 carloads of beef cattle in the train. If there were 27 beef cattle in each car, how many beef cattle on the train? (6) If the cattle averaged 820 lb. each, how many pounds did all the cattle weigh?"

These are very unfortunate problems for sixth grade children. Less than 5% of the adults in America have ever seen stockers and feeders shipped. Adults generally know little about the weights of cattle, and they don't know how many it takes of 820-lb. cattle to make a car-load. The first question would be: "How many cattle-cars do we need to handle 270 cattle of this size?" These problems can scarcely be real problems for any sixth grade class, even in the cattle country; they are beyond sixth grade experience.

Among real problems there are two types of units, basic and special. Basic problem units relate to some phase of the family budget,—food, clothing, shelter, savings, insurance, investment, recreation and higher life, health. Insurance may come partly under savings, partly under health. Taxes affect the budget as an important expense item.

How much is spent for food by a family depends first upon the family income, second upon the ages and needs of the members of the family, third, upon a number of items, chief of which is the availability of particular foods. A former teacher of mine who married a farmer, wrote me in answer to an inquiry that she spent less than two dollars a week off the farm, for the food for her family of two adults and a thirteen-year-old son. The farm provided meat, eggs, vegetables, fruit, butter and milk. Money spent at the stores paid for sugar, coffee, condiments, a cigar for the husband for Sunday evening, and occasionally some candy for the son. Problems relating to feeding this family would be very different from the problems of the usual city family.

In spending the family income, food becomes the first consideration. Miss Upley, a fifth grade teacher who developed a unit on "What does it cost my parents to feed me for a month?", had both city and country children in her class. This problem[1] which the teacher told the children was too difficult for them, but on which they chose to work, was pursued for two months two days each week, by a very interested group of children. Before it was finished it involved not only income and budget, but balanced rations, vitamins, and calories per unit of weight. It involved gathering information from Washington and from the State Department of Health. Several children modified their eating habits. Over-weight children eliminated candy, reduced on bread and potatoes, ate more fruit. Thin children drank more whole milk, ate more eggs and whole-wheat bread. This was an informing, worthwhile unit for teacher as well as pupils; all worked together, and really worked. There was some difficult figuring, but it was so highly motivated that difficulties didn't matter, and the teacher was there to help when necessary. The teacher was a learner, too, as she should be.

Co-operating with the writer, ex-

1 Milda M. Upley, "Thrift: A Functional Porblem Unit." EDUCATION 65: 460-463, April, 1945.

perimental basic problem units have been developed by teachers of all grades from kindergarten to senior high school. A third grade group that plans, buys, prepares, and serves a breakfast, may be working to capacity as fully as a junior high school group that plans for the buying and upkeep of the family car, or a senior high school group that plans life insurance for the family, or figures the tax rate for a town as determined by the town warrant and the report of the advisory committee. All are real problems as in life. They are planned and solved as real problems, not for the use of particular processes in arithmetic. Processes involved are incidental and the teacher helps as necessary. Work on some processes will be motivated by good problem units, but not every process used in a problem unit will become the object of drill for mastery. For work on a seldom-used process, such as square root, if needed, the book will be used as a reference, and the teacher will help. A detail involving a seldom-used process might be assigned to the "mathematics shark" of the class (a bright pupil), and the teacher. Sometimes a particular phase of the problem may be taken to an expert in the community, such as the banker, or an architect, exactly as in life.

Special problem units are more strictly vocational and connect closely with the community and its business, —cranberries, summer cottages, clams, and draggers on Cape Cod; corn and hogs, soy beans, wheat, dairy cattle on a farm in the Middle West; citrus fruit, strawberries, and truck crops in Florida, southern Texas, and California. Children must be mature enough to understand the vocational significance of special problem units undertaken, and the immediate community must provide the background. A textile unit at the junior high school level in New Bedford, Mass., opened the eyes of the teacher (Miss Murphy) as well as those of the pupils, as to the operation of a great industrial enterprize,—shipping cotton from Texas (by boat) or Arkansas (by rail) and processing it into sheeting or duck in New Bedford. Any good problem work will always develop business insight, and frequently it will involve good teaching in geography or economics. Good problem work in arithmetic is never isolated.

There are at least two basic theorems for guidance in problem work in Arithmetic:—Theorem I. Profitable functional problem units are of two kinds,—*basic,* relating to phases of the family budget, and *special,* relating to vocational activities of the community. Functional problem units use basic arithmetic as a convenient and useful tool for business (and science), and they put real meaning into the work in arithmetic.

Theorem II. Real problems must be developed and solved in the light of the experience, interests, and needs of the children and their home and community backgrounds. Units should not be passed down from year to year; each unit is a new venture; conditions vary constantly.

To the above, at least two correlaries should be added:

Cor. 1 Isolated problems as they appear in problem scales and texts have negative rather than positive value for arithmetic. Teachers should discontinue their use.

Cor. 2. A problem unit that involves no work or new thinking by the

teacher is probably so poorly conceived as to have little value for the pupils.

Teachers who have been using functional problem units will follow the above brief discussion without difficulty; others may appreciate references to some of the writer's previous discussions.[2]

Good problem work in arithmetic can provide the school with one of its finest educational opportunities, but for a full century, at least, educators completely "missed the boat" in the types of problem work provided for the schools. Anderson[3] shows that Pike in one of the first textbooks in arithmetic in America, had the idea of helping business men to solve particular types of problems and he gave type problems with solutions in his text. He had no thought that these problems, with solutions omitted, would ever be assigned to children. But Colburn in a text that dominated the work of arithmetic in the schools for generations, substituted "number by development," or mental discipline, as chief criterion. It is that criterion which continues to dominate the choice of problems in most arithmetic textbooks used in the schools, notwithstanding the general recognition of its futility as a guide. The children are entitled to something better, and the teacher who learns to work with her pupils in the development of functional problem units will find in such work not only a new joy, but an enriched and developing life for herself as well as for her pupils.

Special units often take the form of individual or small group units. Twin brothers had wanted an open porch screened. Their teacher, Miss Kett, helped them to plan it, make drawings, prepare a schedule of materials, and estimate costs. Their father was impressed, and the following summer the porch was screened, with copper wire in removable sections.

Shea sponsored a six-room house plan as a special unit for a junior high school pupil. Moore developed a roadside stand with fifth grade pupils. A sixth grade boy bought a pair of rabbits for profit; that problem called for occasional consultations between pupil and teacher throughout the year. A seventh grade girl invested in a dozen hens (her mother helping with financing), sold the eggs to her mother and the neighbors, and got out with a profit after a year of it, in spite of high prices for feed; kitchen scraps helped, and garbage was no longer just garbage. Cummings, in Brookline, Mass., with a senior high school group of older girls, rented and furnished a four-room apartment; needless to say, the girls were tremendously interested.

It is evident from the above discussion, that good functional units in arithmetic can bring the school very close to life. The teacher who carries such work properly and successfully will begin to realize what Dewey meant when he said "The good school *is* life."

Among the problem units which follow, most of them are *general* and relate to various phases of the family

2 See, *Teaching the New Arithmetic*, Chapters 22-27. McGraw-Hill Book Co., New York, 1939. Also "Criteria of the Written Problem in Arithmetic." *Education*, 59:459, April, 1934.

3 Mae G. Anderson: *Written Problems in Arithmetic Textbooks*, Master's Thesis, Boston University, 1933.

budget,—food, clothing, shelter, higher life and saving.

Mrs. Collinson's unit on "Dragging" is a specialized vocational unit usable only in fishing villages, and then only when a pupil in the class has or has had close contact with a dragging crew. Miss Shea's "Flower Shop" unit would be a special unit if placed in a higher grade and developed as a trade or profit possibility. Mr. Dahill's unit in surveying looks toward vocational specialization. It shows the possibilities of some practical applications of mathematics; that few high school pupils realize this is due to the inertia of high school teachers of mathematics. Mr. Dahill's article should be helpful and stimulating to junior and senior high school teachers.

Whether a problem unit be *general* or *special,* it must be true to life and fit into community practices in order to be truly functional.

Dr. Zim's article showing the values in informal number work at lower age levels, suggests strongly that arithmetic work might with profit be less formal at all ages. All number work should be immediately useful in child thinking and find a basis in experience. The experience basis and adequate motivation should precede any drill at any age level.

"teaches the child to find out for himself"

THE TEACHING OF ARITHMETIC

by Herbert F. Spitzer, Associate Professor of Education
State University of Iowa

THIS BOOK

will help beginning and experienced teachers in developing understanding in the classroom. The author's method is characterized by the creation of situations in which the child may see a reason for learning the things he is taught. New facts and processes are introduced through problem situations. Teachers will find particularly useful the abundant descriptions of actual classroom procedures—36 lessons or parts of lessons. *$3.00*

HOUGHTON MIFFLIN COMPANY BOSTON · NEW YORK
CHICAGO · DALLAS · SAN FRANCISCO

A First Grade Reports *on* Its Plant Sale

By GERTRUDE M. ROGERS
Critic Teacher, Grade One,
State Teachers College, Bridgewater, Mass.

WE wanted some library books and a chair like one in another room.

The Fifth Grade were selling seeds.

Our class decided to have a plant sale. We would buy the seeds from the Fifth Grade.

A committee went up to ask, "Please could you tell us what you have?" and "How much are they?" The committee returned with a box containing all the seeds. It was voted to buy tomato and marigold seeds.

Buying the Seeds

We bought the seeds from the Fifth Grade with the teacher's money. We are going to pay her back. We took 20¢. We bought two tomato and two marigold packets of seeds. They were 5¢ a piece. These are some things we know:

1=5¢ 2=10¢ 3=15¢ 4=20¢

5, 10, 15, 20

Two 5's or 10¢ for tomato seeds.

Two 5's or 10¢ for marigold seeds.

Two 10's or 20¢ for our seeds.

Planting the Seeds

We got one flat from the garden, and Joseph brought one box for a flat. Leonard brought one flat to school too. That made three flats. We found one in school; that made four flats.

1+1+1=3 flats

3+1 =4 flats

2+2 =4 flats

We put the soil in the flats. We smoothed it over. Then we took a stick and made a trench for the seeds to go in. The trench was like a groove or a cut. Each of us scattered a few seeds in the trenches. Then we covered them over with the soil. We took a little and put it over the trenches. The seeds could not push their noses up if we put on too much soil. Then we sprinkled some water on the seeds so they would grow. We put the names of the plants on long sticks and stuck them into the soil. We carried the flats into the green house where the sun could hit them and help the seeds to grow.

Caring for the Plants

We took turns watering the seeds. They were in the middle of a big table.

One day the seeds were up. They had little tiny green leaves. The plants grew bigger and bigger. Some were one inch high. A big one was two inches high. We measured so we could know. We guessed first. We practiced by measuring lines on the board.

12 inches is a foot.

This says one inch, two inches, etc.

Then we went down to the green house to transplant the little plants. We dug them up and put them in little boxes. We made holes to put the plants into. We watered them and put the soil on carefully. There were a dozen tomato plants in one box and a dozen marigold plants in one box.

6 is a half a dozen 12 is a dozen.

We counted the boxes. We had 43 boxes.

Getting Ready for Our Sale

While the plants were growing we talked about our sale.

Some of the things we need to do or learn:

1. How to take our plants out of the boxes if we sell one or two or three plants.
2. If children buy our plants and give us too much money, we have to know how to give them the right change—to add up.
3. We have to bring up the tomatoes and marigolds.
4. Put up a sign to tell the other children how much they are.
5. Make a poster to show the other rooms ("a poster is like a sign that tells you what is going to happen").
6. Make tags with the price on them to stick by the plants.
7. Make out slips to take home to our mothers so they will know how much, say a couple of days before our sale.
8. We have to decide how much the plants will cost. How much a box will cost and how much a plant will cost.

Learning How to Make Change

Signs downtown say 1 dozen for 50¢. How big are the plants—5 inches? They are higher than ours!

We used our milk money to find out how to add up money and how to give back the right change.

Like—if the plants cost 5¢ and the child has 10¢, you would give him the right change back—5¢ for the plant; 5¢ for him.

5¢ is a nickel
10¢ is a dime
25¢ is a quarter

The Day of the Sale

Eight children brought their carts from home. Each child who had his cart chose a helper. They went down to the green house. They came out one by one with a box of plants. When a cart was full, two children took it back to school. Some carts were big and some were little. Some children carried 5 boxes and some could only get 3 boxes in their cart.

The children who did not go to the green house got the room ready.

Our Plant Sale

The people came and bought our plants.

We had made posters and signs with numbers on them. They told how much the tomatoes and marigolds cost.

Some were 25¢ a box.
Some were 20¢ a box.
Some were 10¢ a box.
Two plants were 5¢.
One plant was 3¢.

After the Sale

We put how much the people paid on our sales slips. We counted our money. We had $14.03.

We paid 20¢ to our teacher. We owed her the money.

We bought the chair we wanted and some books and puzzles.

We like our books. The stories are good. We can do the puzzles.

We sit in our chair and read. We have to take turns.

(So ends the children's report.

The children through their own efforts had their books and chair. At the same time they learned to count, learned the combinations through ten, learned about money and its use. They also learned how to write figures. The unit proved to be an excellent problem unit for the first grade. They studied facts and conditions and tried to use good judgment, as any business man should).

Christmas Arithmetic

By MRS. MARY ELDREDGE
Teacher, Grade 1, Chatham, Massachusetts

A BOX of Christmas seals and two pads of red and green paper lay on my desk that morning when little Ellen came into the room, with a bright, "Good morning, Miss Smith." Ellen looked at the seals and asked, "Oh, Miss Smith, is it going to be Christmas in school too?" I replied quickly, "Why, of course, Ellen, it's going to be Christmas everywhere," but my second thought was one of surprise and enlightenment. For the first time I realized that apparently at least one of my first grade pupils thought of school as a place apart—a different little world from the familiar one outside the school building and at home. I put that thought into a reserve pigeon-hole in my mind to be taken out when I had time to give it uninterrupted attention.

Later that same afternoon, when the school room was quiet, I sat at my desk with pad and pencil, making notes and finally evolving an outline, as one thought led to another, idea followed thought and plan succeeded idea. It seemed to me that (1) school must be a place where living goes on. It must be the best and finest type of living. (2) It must be rich, wholesome living, suited to the age of the youngsters, where they can feel a purpose and pursue their purpose, alone at times, but more often in groups. (3) Play is learning. School work and play should be the kind that will raise as best it can the quality of living at each age level, with a small percent teacher participation, and a large percent pupil participation.

Too many textbooks in education, I thought, are long on principles, theories and out-dated material, and short on children and practical applications in the learning situation. A child is interested only in his present problem. Each child's present interests should be utilized to motivate and lay the foundation for skills and learnings. Little Ellen, for instance, could be shown that Christmas, the thought of which brought such a happy light to her eyes, does not stop at the school door; that even arithmetic and spelling can be made an unconscious, but helpful and instructive, part of Christmas.

The next morning I asked my first graders if they would like to make some suggestions as to how we might celebrate Christmas in our classroom. It took a few minutes to "break the ice," but when the realization came that they were going to be allowed to plan for themselves, the response was heart-warming. It was finally decided that it would be fun to give a Christmas party for parents and friends, a party they themselves would plan and carry out.

This seemed to me a perfect opportunity through which I might awaken in them arithmetic consciousness and a quicker perception in relation to quantity, measurement and evaluation. This would come, I felt sure, by letting

the children live through real experiences, activities and games which would give them information, understanding and enjoyment in applying the skills to be used. Arithmetic taught in modern schools is not an activity detached and isolated from all other activities and experiences, but is rather integrated with activities of the whole program, and is the outcome of those experiences.

The first grade child has many immediate definite needs for number. He should be taught the meanings, information and skills involved in such a way that, when the systematic treatment of facts and processes come later, this experience background will be invaluable to him. I hoped to prove this with our Christmas party.

The first half hour of each morning was set aside for discussion of the party and progress reports. Plans were written on the board as the children themselves made them.

Appointment of committees came first and each child in the room participated in the activity of one of the committees; each had a duty, knew it, and was responsible for it. To do this, the children had to count (1) the number of children in the class; (2) the number of boys; (3) the number of girls; (4) the rows of seats; (5) children in each row. Touching each object as counted and counting orally impressed that number the more firmly in each child's mind. Counting silently, and then checking with the teacher; finding the number of objects asked for by the teacher or another pupil, this took concentration. And, finally, counting without objects tested the children's knowledge of the sequence of number names. Making figures was part of the daily writing lesson and forming figures was carefully taught in order that no child should be allowed to acquire wrong habits.

Committees were chosen to take care of invitations, decorations, entertainment, and refreshments for the proposed Christmas party.

A daily record was kept in the following form:

Articles	*Number Needed*	*Number Ready*	*Number to be made*
Invitations	50	40	10
Cups	90	42	48
Plates	90	50	40
Napkins	90	45	45

Each day this list was checked and changes made according to what had been accomplished.

Unconsciously the children learned a spirit of cooperation, and the splendid lesson of team work was demonstrated as the various committees worked together on their problems. Helpfulness, kindness, courtesy and thoughtfulness brought their reward of praise from the teacher and the joy of accomplishment to each child.

The calendar soon became a ready reference as, each day, the children figured out the number of days until the party; the number of days left in the present week; the number of weeks until the party; the number of days in a month and the number of weeks in a month. Fractions seemed almost simple when one half and one-quarter became the folds of a paper napkin.

How quickly new words were added to small vocabularies as the plans went on! Chairs were "large" or "small"; tables were "long" or "short;" decorations must be cut "wide" or "narrow" and cookies should be "thick" or "thin." Circles and squares were demonstrated by the squares of chef

foil to hold oranges or the circles of red paper to be placed under lace paper doilies. Of course there must be music and "pieces to speak," with children arranged in groups to sing—tall, taller, tallest—short, shorter, shortest—this with reference most often to the recitations.

As the day of the party came closer, excitement mounted. New words again—"enough" (cups, plates), "how much" (gingerale), "how many" (cookies.) Inches, feet and yards meant decorations, and pints and quarts were divided down into paper-cupfuls. One quart would fill 10 paper cups, so we must have 10 bottles. Then, these things cost money, so we delved into the mysteries of pennies, nickels, dimes, quarters and half dollars. We were back to numbers again and again and, by repetition, they became more familiar.

The day of the party finally arrived; then the hour—checked off by the children on calendar and clock. Parents beamed with pride and children radiated excitement and delight in the accomplishment of having *their own* party.

But to the teacher it was the fulfillment of a hope, the vindication of an idea. Beyond my satisfaction in the success of the party was the feeling that the children had been given an experiential basis for learning arithmetic which will give them information, success and enjoyment in acquiring arithmetic skills, at the same time being mindful of the total growth of the children in developing attitudes toward right living and the development of emotional stability.

NEWCOMB & GAUSS CO.

Book - Job - Commercial

PRINTERS

No. 1 CITY HALL AVENUE SALEM, MASS.

Grocery Store: *A* Problem Unit

By HELEN M. SYLVIA

Teacher, Grade 2, Provincetown, Massachusetts

A GROCERY store gets children into the very center of the life of a community. Food is the big item of expense in the family budget, and most buying of food is done at the grocery store. If the mothers are properly interested, many purchases at the store can be made by the children. To take money, to buy something, to return with the correct change—that is a real experience for a second grade child, and nothing else I can do in arithmetic is quite so educative. There is interest, there is motivation, there is essential experience and understanding, there is the possibility of growth in personality and power, the child is made a more intimate and essential part of the home and the community.

The child's school days and his life outside the school are too often entirely unrelated. We know that life itself is the most effective educator. The school must provide time for children to think and to plan and to live out the plans they make.

The start on our grocery store unit came from a question by a child. Janet asked me if we could play store sometime. She said that she went to the store very often for her mother.

I asked the other children if they did errands. Only a few hands went up. The group decided to talk it over themselves. Janet was elected the head of the group. She told the group that she always took a list written by her mother.

The pupils discussed different kinds of stores and experiences they have had in doing errands. Finally they decided on what kind of a store they would like to have. A general discussion arose as to what should be done. Questions came up concerning the grocery store. A list of things to do was written on the board.

I told the children that the grocery store was the immediate source of food for our daily meals. Grocers secure their goods from many different places. Sanitation is very important in handling foods, and courtesy is important in business. This was explained within the child's vocabulary.

They planned to have the store at the rear of the room. The children began bringing empty cartons, cans, and paper bags. A toy register and two toy telephones were brought in. A large bookcase made of orange crates was used for the shelves, and a small table for the register. One telephone was placed near the store and other one at the opposite end of the room for the use of customers who might wish to telephone orders. A sign "The Cape Cod Grocery Store" was printed and put up in front of the store.

The pupils took several trips with me to the A & P stores. They studied and noted prices and the arrangement of goods. Pictures of food were cut out and pasted on large sheets of colored paper. Posters of fruits and vegetables were made. Stories of foods were looked up during research period.

Original problems were made involving buying and selling. They made lists of cartons and cans for which they didn't know the prices. A group of pupils took a trip to the A & P store to learn the prices of these articles. Local foods such as cranberries, blueberries and various kinds of fish were also listed. At this time, I told them about frozen foods.

I showed them that in order to be a good clerk, they had to practice on how to wait on customers, what to say to them, how to show goods, and how to be friendly and polite. Part of each arithmetic period was given over to learning how to make change for .05¢, 10¢ and 25¢. Several children could make change for .50¢ and $1.00. Telephone conversation was also practiced.

There were many direct and indirect outcomes. The pupils recognized a penny, nickel, dime, quarter, half dollar and dollar. They could make change as two nickels for a dime, five nickels for a quarter, two dimes and one nickel for a quarter, and two half dollars for one dollar. Incidently, they learned liquid measure and ounces in a pound. Problems involved in buying two or three things such as 1 lb. butter, 1 dozen eggs, and one quart of milk were made up by pupils. Counting of articles bought, and counting of change (additive method) came at this time. The pupils listed the customers' telephone numbers. They also made out bills for customers on the board and on slips of paper.

The pupils read the names of articles and prices. They looked up information about foods in which they were interested. During the language period they told about the foods they had looked up. The clerks and customers tried to use good English. They conversed pleasantly with one another, also intelligently and in a business like manner over the telephone.

In written language the pupils wrote three sentences about their experiences in going to the store for their mothers, or about something they read, —a paragraph of about three sentences including a capital at the beginning of each sentence.

The clerks learned to spell some of the names of articles for sale, and the words for the posters.

Creative drawing was done as often as possible. Drawing and coloring of fruits and vegetables and also various kinds of local fish. Letters for posters and toy money were made freehand. Original posters and slogans were worked out showing ingenuity and originality in working out advertisements.

In the social science field, the children did research work in regard to various kinds of foods. They found out where these foods came from, why they grow in certain climates, how these foods are kept and how transported to this town.

We had a discussion of the importance of certain vegetables and fruits in relation to body building. Milk and cereals in relation to the growing child. Importance of certain foods to make children grow strong and healthy. Cleanliness in the store and clerks obeying the rules of cleanliness in handling food in a store.

A list of groceries was made to save the clerks time. The customers must be polite at all times, and take their turn at being served by being orderly. Change should be counted before leaving the store. The clerks must be honest in making change. The custo-

mers and clerks should respect the rights of others by using some form of courtesy. They should become self-reliant, do their share of work in a pleasant, friendly way and not forget to say "Please and Thank You."

Our unit reached out to modify the work in music. A simple song was worked out about fruits and vegetables. A play was arranged and planned by the pupils. It was called "Going to the Grocery Store for Mother."

The major objectives or outcomes related to numbers:—The pupils had better lessons in arithmetic through interest and better understanding. They built up many number concepts through these concrete experiences so that not only will drill be meaningful when it comes but much less drill will be needed to fix essential facts.

There were good appreciation effects. The children wanted to learn more about foods in their daily lives. The pupils wanted to find out more about money.

Conclusion:—

Buying and selling provides the most common usage of arithmetic.

The "play" store gives constant practice in money for these purposes. The child's work is motivated when he sees and feels that he needs what he is doing and learning. He regards the work as a means to an end. Motivation is intensified. It involves the group as well as the individual. The modern trend is toward the useful. This is especially true in arithmetic.

THE SPRINGFIELD TEACHERS' AGENCY
ROBERT S. MACDOWALL, B. S. in Ed., M. Ed. Manager
"The Right Teacher for the Right Place"
1570 MAIN STREET SPRINGFIELD, MASS.

THE JEAN BENNETT TEACHERS' BUREAU
3 CONWAY STREET ROSLINDALE, (31) MASS.
Pa. 7-7634 JEAN BENNETT, Director
"A Personalized Service for Administrators and Teachers"

BRYANT Teachers Bureau
711-713 WITHERSPOON BLDG. PHILADELPHIA 7, PA.
M. A. Bryant
Thos. B. R. Bryant
W. D. Greulich
Member—N. A. T. A. *PEnnypacker 5-1223*
CONSULTANTS TO SCHOOLS AND COLLEGES
Quality Positions Listed Throughout the Year
FROM NEW YORK PHILADELPHIA SUBURBAN AREAS TO DISTANT POINTS
31st year of Placement Service

"*The* Children's Grocery Store:" *A* Problem Unit

By VESTA L. GOULD

Teacher, Grade 2, Eastham, Massachusetts

THE initiative for our problem unit started when the children were discussing what they would like to do when they grew up. Among other types of work, some thought they would like to be storekeepers. When asked if they would like to have a store in the classroom, they were very enthusiastic.

All had been to a store and bought candy or ice cream and a few had done errands for their mothers. The larger percentage of the class had older brothers or sisters and they usually did the errands.

Different kinds of stores were discussed and the children finally decided that they would like to have a grocery store.

Things that were needed to make the store were talked about next. Our classroom has an alcove in which is a sand table. They decided that if they had some shelves, they could put them in back of the sand table and use the table for a counter. Boards were needed to cover the sand table and for shelves. The children measured the table and found it to be six feet long and two and a half feet wide. The first problem was to get the boards.

The following day one of the boys said that his father had some boards that we might use. He said that they were six inches wide. We found that we would need five boards to cover the table. In the meantime the Janitor informed us that there was a table top in the basement which could be placed on the sand table for a counter. This seemed more practical so we planned to use the boards for shelves. Four orange crates were obtained from a nearby grocery and put behind the counter on which to place the boards. These made two good shelves on which to display the articles.

The children brought in all kinds of empty packages and cans from home. They included: bread, eggs, cereal, sugar, cocoa, fruit juices, doughnuts, crackers, puddings, milk, cream, soups, butter, margarine, coffee, tea, and soap powders. Price tags were made for each article.

The complete price list of articles for sale in the Children's Grocery Store follows:

eggs	80 cents dozen
sugar	9 cents lb.
milk	12 cents can
cream	33 cents jar
butter	69 cents lb.
margarine	37 cents lb.
coffee	43 cents lb.
Shredded Wheat	17 cents pkg.
Wheaties	16 cents pkg.
Rice Krispies	16 cents pkg.
jello	8 cents pkg.
chicken soup	17 cents can
animal crackers	6 cents pkg.
bread	16 cents loaf

doughnuts	30 cents pkg.
Ivory soap	14 cents bar
gelatin	23 cents pkg.
confectionary sugar	12 cents lb.
peas	23 cents can
string beans	21 cents can
Pineapple juice	39 cents can (large)
orange and grapefruit juice	21 cents can
corn	23 cents can
Spry	43 cents can (1lb.)
cocoa	15 cents can
chocolate pudding	12 cents pkg.

It was decided that as the store belonged to the children it should be called "The Children's Grocery Store."

The father of one of the boys was a clerk in a grocery store and he gave us posters which we displayed advertising different kinds of food. On one the prices could be changed as prices changed. For example, eggs were selling at 80 cents when we started the unit but one day a child came in and said that they were selling for 75 cents so he changed the sign. When several of the others came in they noticed that the price had been changed and thought it was incorrect until they were told otherwise.

After the store was completed pupils were chosen for the storekeeper and customers. At first they went to the store and selected one article. They were given real money and counted out the right amount to pay for the article. The storekeeper then counted it to see if it was correct. For example, a child bought a package of "Wheaties" for sixteen cents. He counted out a dime and six pennies. Another suggested that if he did not have six pennies he might give the clerk a dime, a nickel and one penny.

When they had become familiar with dimes, nickels and pennies, the quarter was taken up, then the half dollar and dollar. These larger pieces involved making change. They made change by counting. If an article cost 23 cents, the customer gave the clerk a quarter. The clerk would say, 23 and 2 are 25 and gave the customer 2 cents.

Later two or more articles were purchased, this involved addition:

1 can milk	12 cents
1 bar Ivory soap,	14 cents
	26 cents

The children have enjoyed working on this unit. Each day incidents are brought up which show that they have been thinking about it outside of school.

At recess when they cannot go out of doors or when they finish their other work, they invariably go to the store and play.

Mothers have remarked about how interested their children were in the store.

In working on this unit, the children have learned that:

eggs are sold by the dozen
bread—loaf
sugar—pound
milk—quart
cream—jar
butter—pound
margarine—pound
coffee—pound
tea—pound or package
cereals—package
flour—bag, pound

In measuring the shelves children became familiar with the inch, foot, and yard.

In using money, they learned that:

5 pennies—1 nickel
2 nickels—1 dime
10 pennies—1 dime
2 dimes and 1 nickel—1 quarter
2 dimes and 5 pennies—1 quarter
3 nickels and 1 dime—1 quarter
2 quarters—1 half dollar
5 dimes—1 half dollar
2 half dollars—1 dollar
4 quarters—1 dollar
50 pennies—1 half dollar
100 pennies—1 dollar

The learnings were natural, through usage,—no formal drill, no pressure.

Language also came into use when a customer went to the store and talked with the storekeeper.

Politeness and courtesy were emphasized.

STECK now offers you and your pupils a
Complete Primary Numbers Program
Working With Numbers
WORKING WITH NUMBERS
Worktext ® assume a greater part of your teaching load. Simple explanations and step-by-step procedures help children to grasp difficult concepts. Adequate drill material assures that the child will acquire and retain facts and skills. Looseleaf tests for each book; Teacher's Manual.
plus
WORKING WITH NUMBERS TEACHING AIDS
Carefully developed to accompany the Worktext, these aids save you time and effort formerly spent in making your own pictorial and semi-concrete materials. The Teaching Aids are attractively printed and colored and conveniently packaged. Write for Complete Information.
THE STECK COMPANY PUBLISHERS AUSTIN, TEXAS

Rummage Sale: *A* Problem Unit

By HELEN L. HILCKEN
Teacher, Grade 3, Chatham School,
Chatham, Massachusetts

HAVE we as teachers made number meaningful? I believe the best way to help a child understand numbers is through his own experiences, not through a textbook. Actual life experiences will certainly make arithmetic more meaningful to a child. If we had more life's experiences in Grades 1 and 2 with less formal arithmetic there would be more meaning for the child and less failure later on.

A child must see a need for a process in order to succeed in that process and obtain satisfaction. What better way can we get a child to see that need than through a problem unit? I believe the social business phase of Arithmetic has been neglected and that we have been working too much on the computational aspect with no real purpose in view.

To this end I put aside my text book and made room for a problem unit, one that involves a real social situation rather than an imaginary one, one in which actual judgment in business is called for. The business enterprise was a rummage sale, and the approach was most natural.

We have in our town a new Community Recreational Hall. The old one was damaged by the hurricane and had to be torn down. Money was needed for a new building. Some of the ladies of this little village had a rummage sale for a whole summer and in that season earned over one thousand dollars.

The question came up, could our third grade have a rummage sale of our used toys, toys that possibly we were tired of. Some child might want something which he didn't have and for a few pennies could buy. I brought the idea before my group and they were very enthusiastic. This was Friday. We talked about what we could do with the few pennies we would receive. There were responses such as buy a radio, victrola, colored paper, books etc. The pupils hunted up what a radio or victrola might cost and they saw at once that they couldn't possibly get any amount as large as that, and promptly settled for buying some books for our very inadequate library.

On Monday, I was deluged with toys. The children not realizing the work involved expected to buy the toys the next day for they started bringing in money with which to buy. I took account of and kept the money that day until we could appoint a treasurer. I listed the money on the board as they brought it in to me 25¢

5
6
5
7
4 and we

proceeded to add this up. I previously had taught the related facts 11+1

through 11+9, 12+1 through 12+9 so the children could start to add the column without any trouble 7+4=11, 11+5=16. They knew or else reasoned that 16+6 would end the same as 6+6, the 22+5 would end like the 2+5, and the 27+5 like the 7+5. Therefore we could add the column to 32. They saw the decade drill actually in practice. I wrote down the 32 and said nothing, then wrote the 2 from the dimes row so I had 232¢. One girl counted the money and we only had 52¢ in our bank. Two of my children realized we had to carry so I went into the process a bit and later used this for my drill period work.

Tuesday, this morning the children brought in these amounts

5¢
5
15
28
10
10
10
5
5
10
11
10
9
5
5

$1.43

The children did a fine job adding this amount but they saw a need for learning to write dollars and cents instead of 143¢. We then added

$1.43
.52 not 52¢ any more

$1.95

In counting the change from our bank to see whether we had that amount I actually had 4 quarters, which we grouped to make one dollar, 2 more quarters, one dime making a total of $1.60 and all the rest of the money was in pennies. Someone suggested that we count those by 2's instead of 1's.

Friday, the first work for this day was the making of ballots, 1 inch by 2 inches, and we voted for the person to act as Treasurer to take care of the money that was being brought in. This was in our bank. The Treasurer's book had of course to agree with the bank money at all times. Each day Anne (the one who was elected) wrote down the names of the people who had given her any money on a slip of paper to give me, to list on the board. She checked her money with the list before passing the list and the money to me. Then after listing the amounts on the board we would add each day to see how much money we had. On each Tuesday and Friday thereafter individuals counted the money to see if the Treasurer and the bank agreed. She would enter these various amounts against each child's name in her account book. Each depositor was asked to keep a check on the amount he had in the bank. Nearly every child knew when questioned at the end of each week just how much he had. During the whole unit Anne was only 1¢ out.

Tuesday, we checked up our money. We started to make labels. This involved measuring 1 inch by 2 inches.

Friday, during this period we took account of what we had for our rummage sale. We had decided we would have to visit some stores to find out what the actual prices of our books,

toys etc. really were before we could set any sale prices. Several children volunteered to visit the 5 and 10¢ store and the Mayflower Shop to see what they could find out. They made a beginning report today.

We started with our many books which when new sold for 10¢. We decided on a sale price ranging from 2¢-6¢ according to the condition of the book. We then made the labels for many of the articles, labeling whichever way the child desired 3¢ or $.03 and put them away for safe keeping. Our little problems that day involved "How much will I save if I buy at this sale?"

Tuesday, we found a discrepancy in our bank account. I had more money than our Treasurer's book said we should have, or rather I had more than we had added at the board each day. I asked for suggestions as to what we should do. Someone said to add each one's savings and that should equal my cash. We put each child's amounts on the board and had volunteers add. Then we added all the amounts together and we were just 1¢ out of the way instead of the 36¢ we were at first. Evidently one day when Anne gave me the money I neglected to have someone add that to the previous amount on the board. But it was good practice and the children enjoyed the thought that I had made a mistake.

This Friday we did more labeling after more reporting on prices found in the stores. The mothers helped us out too. We had to ask them how much material it would take to make a doll's dress or how much the dress would cost when new. Really I was very much surprised at the number of articles for which they did find the prices. We made little problems up, "How much would this and that cost if we had money to buy two articles?"

The following Tuesday we made final arrangements, finished labeling, chose a storekeeper by secret ballot and voted for three clerks for we anticipated big business, having in our bank $8.25. We made up more problems and practiced making change.

Friday. This was the DAY. How busy we all were, wondering if someone would get ahead of the other fellow and buy what he wanted. This was my problem how to make it fair for I couldn't have 40 children around the table at once.

We got our table all arranged. Before the sale began Mr. Kelsey the photographer came to the school and took some pictures. One child printed on the board "Our Rummage Sale" so it would show in the picture.

Next came the drawing of the money from the bank. I had plenty of change. Each in turn came to my desk and took his own money from the box. If he had 32¢ in the bank he would count out 1 quarter, 1 nickel and 2¢. Only two children in the entire room had no deposits, one of those had brought money that very morning. Only three children needed any help in taking out the proper change.

Now to go to the table to buy, I had slips of paper on which the children wrote numbers starting with 2, 4, 6, 8, etc. and 3, 5, 7, 9, etc. until each child had a number. These were collected and shuffled. We drew out 6 numbers at a time so there were always 6 at the table. And what fun they had. I had brought about two dozen surprise articles from home and I overheard two of my boys say "I'm going to buy one of those handkerchiefs for my mother." One of the clerks was most

polite with her "May I help you?" Mr. Bassett, our principal came in to watch the fun and seemed much impressed.

When at last the sale was over the storekeeper with the help of his clerks counted and checked and we found we had made $6.83. Later we voted for a committee of four who went with me and we purchased twelve library books for our reading table.

Sometime during this unit it was suggested we could save our money if we didn't spend it all toward the buying of Christmas presents for their own families. This was the next problem unit which we developed. During the progress of this unit I took everyone of the 40 children Christmas shopping. They enjoyed it, and it obviously furthered the purpose of business thinking.

Outcomes in terms of arithmetic learning from the rummage sale were:

1. Adding—with carrying
2. Subtraction—how much more will this article cost than some other
3. Making change
4. Two ways of writing cents 5¢ or $.05
5. Counting by 2, 5, 10
6. Adding dollars and cents
7. 4 quarters equal one dollar
8. 2 half dollars equal one dollar
9. Numbers must be in a straight line in order to add.
10. Measuring one and two inches
11. Does our answer seem reasonable?
12. Many simple problems

Outcomes in terms of other learning:

1. Writing of labels—good clear figures
2. Abbreviations of the days of the week
3. How to elect an officer
4. Encouraged saving of pennies
5. Desire of the children to do other saving
6. Politeness in regard to other people

The children gained a lot of experience in money counting and business thinking in this unit. It is more and more apparent to me that if a unit is organized as in life, the formal learnings will take care of themselves. As children suggest other units, they are noted in a certain place on the blackboard. When we are ready for a new unit, the children may choose which one it shall be.

"Our Bundle *of* Friendship": *A* Problem Unit

By DELLA L. MACOMBER
Teacher, Grades 3, 4, 5, Eastham School,
Eastham, Massachusetts

"FRIENDSHIP Trains" and "Share-a-Shawl" awoke an interest in my classroom of 3rd, 4th and 5th graders. The group, seventeen in all, put their thinking caps on and decided that we send a Christmas package to some child in a foreign country.

We thought we were beginning early enough to get it there by Christmas but so much time was consumed in obtaining a name and correct address that our package could not make the Christmas boat.

Our interest did not lag and at last we were able to obtain the name of a ten year old boy in Scotland, James Cook, a cousin of two of my pupils. A mid-winter gift box, we decided, might be very acceptable. Now our real work began.

A fifth grader was assigned the duty of finding out from the postmaster the particulars regarding the mailing of our package. She reported that the bundle could weigh 22 pounds and 2 pounds of soap were allowable. The postage would be at the rate of $.14 a pound.

Everyone was eager to bring in articles. After studying the maps we found he lived in a cold, wintry land, so winter clothes would be suitable as well as summer things. One child weighed the things with each child checking on his own articles' weight. One pupil recorded the weights in a notebook.

We studied the scales that were used and they were of the standard household kind, weighing up to 25 pounds. Each pound was divided up into lines for ounces, with a longer line representing half pounds and shorter ones for the quarter pounds. The pupils found the number of lines and partitions on the scales were the same as the divisions on an inch of their rulers.

The following list, copied from the recording book, shows the articles and weights of the articles as brought in and sent:—

	Tea bags	1 oz.
2	boxes crayons	10 oz.
2	Chocolate Puddings	12 oz.
2	Vanilla Puddings	12 oz.
	Gingerbread Mix	14 oz.
	Candy Cane	1 oz.
	Hard Candy	1 lb.
	Face cloth, towel	3 oz.
3	Gum, 1 bubblegum	4 oz.
2	Readers' Digests	7 oz.
	Underwear, socks	8 oz.
2	pads paper	4 oz.
	Lucky Clown Game	2 oz.
	Handbag	10 oz.
1	Can Fruit Cocktail	9 oz.
2	Ladies Dresses	1 lb. 4 oz.
	Needles, pins, thread	6 oz.
	Knit hood and mittens	6 oz.
	Marbles	2 oz.
	Notebook, pen, pencils	6 oz.

Corn Muffin Mix	14 oz.
Underwear	4 oz.
Candy Bars	1 lb.
Infants clothes	8 oz.
Carton, wrapping, twine	2 lbs.
	348 oz.

The postage was donated from school funds and teacher.

Different groups, by grades, helped in the packing. We placed canned goods in caps and lined the sides with magazines and stiff materials. The bottom and top were covered with soft materials and corners stuffed with socks.

We talked over the route and method of transportation our package would travel. It would leave the Eastham Post Office by truck and at Yarmouth it would be put on the Boston train. We presumed it would then travel on to New York City by railroad as more ships leave for abroad from that port. We allowed seven days for boat travel, taking into account the storms and gales in winter passage.

Several pupils went to the post office to observe and experience the handling, weighing, checking, declaring the valuation, and postage necessary for international mailing. Postage was $3.08.

Letters were written by the pupils to James to explain why he was receiving such a gift. The best penman, after being examined by the Penmanship Supervisor (she visits monthly and checks our writing) would write the final letter with all pupils signing their names.

Now that our package is on its journey we all hope and pray our labors weren't all in vain and all live in hopes that soon we may know at least one small child was made happy.

In conclusion, I think the children received a lot of meaning from this problem unit. They realized the joy of giving and the fun of buying, weighing, packing, and mailing a worthwhile gift.

This problem made them realize that the measure of weight has meaning, and that U. S. money is used in buying presents and paying postage.

The geographical location of Greenock, Scotland, its climate and latitude was studied in comparison with their town.

Spelling was involved in the correct spelling of address and return.

History was derived by study of transportation of today compared with travel of years ago.

An English lesson was obtained by correct use of parts of a letter and formation of interesting sentences.

P.S. A copy of letter in reply:—

1 Helen St.
Greenock
5th March /48

Dear Mrs. Macomber and friends:

I received your letter and parcel quite safe and I thank you all very much. The parcel came yesterday it was quite battered and torn but everything was in it. I liked the sweets and gum very much as we only get 12 oz. of sweets for 4 weeks and if we buy gum or chocolate we have to give up our sweety coupons for them, everything in the parcel was very useful and mother shared them out. Thanking you all once more.

Your sincerely,
Jim Cook

A Bird Feeding Station

MRS. EMMA HOLWAY

Grades 5 and 6, Truro, Massachusetts

THE snow had entirely covered our playground and the grove of trees near our windows no longer attracted birds for us to study. What should we do? The answer? Construct and install feeding stations in the grove as soon as possible. This was part of our Conservation Club 4 H work. The initial requirements were to build and maintain a feeding station and to build and install bird houses. We should have to learn to measure and judge distances more accurately than ever before.

For a beginning lesson we listed the knowledge we would have to have, the knowledge we already had and the tools and materials we would need.

Our 4 H Club agent sent us plans for use. Then we found we would have to learn to read scale drawings.

The scale drawings we had were so small that we decided to draw our plans to actual scale. Later we went back to the original drawings and learned to read and understand them. Thus we learned their convenience and advantages.

During our first lesson we listed our tools and materials. Individuals volunteered and became responsible for tools and materials to which they had access at home. Leaders were chosen who in turn selected their working groups, and each group looked over and selected plans for use.

During our second work lesson each group worked on scale drawings. Interest ran so high that we used our allotted time plus a full half hour recess period. Two groups completed their plans alone, one group worked out a design of its own, but one group struggled and needed help and guidance from the teacher.

At the end of the third lesson two groups had begun construction, and the other groups had finished their drawings.

Lesson four found the group with the self designed station completed except for hinges, wire, and putty, two groups were about one half through with their construction, but the fourth group made up of slow pupils was having such difficulty with measuring and materials that they had become greatly discouraged and were wasting time and accomplishing little.

Lesson five found the pupil designed station completed and in spite of the zero temperature it was stocked with food and installed in the grove. Before the day was over our bird friends were feasting on crumbs and fat. Group two had their station completed except for the roof. Group three was putting in windows and found their nails were too large. Group four tore their house apart and began reconstruction all over again.

For the final work lesson all houses were completed and installed. Our accomplishments in the project were reviewed and listed.

The check up was as follows:

1. Draw lines 1/16, 1/8, 1/4, 1/2, 1 inch long

2. Draw a frame for a picture one inch on three sides, and one and one half inches at the bottom.

3. How many inches are there in a foot?

4. How many feet are there in a yard?

Some pupils knew the number of feet in a rod and a mile. All of the frames were measured correctly. Inside the frames pictures of birds seen feeding at our stations were drawn and used for room decoration.

One talented child drew the grove, trees and shelters and even the footprints left in the snow by the children who stocked the stations.

The outcomes were many and varied. Everyone was more conscious of accuracy in measurement and had better judgment of distances. They were sure of their simple measures. They had learned to recognize and use eleven different tools and had learned through experience some safety rules in the use of tools. The importance of plans in construction, and the reading and drawing of simple scale drawings were realized.

There were also desirable outcomes in science, citizenship, English, and art. The total effect was wholesome and up-building.

NEW and BETTER WORKBOOKS IN ARITHMETIC

Here is a new series, hot off the press! Its mere newness doesn't make it good, but other factors do: its wealth and variety of drill material; its built-in "Refresher" process presentations; its careful, scientific grading; its appeal to pupils; its over-all attractiveness. These books *are* new—and they *are* better!

THE "BUILDING WITH NUMBERS" ARITHMETIC WORKBOOKS

By PATTON & YOUNG

BUILDING WITH NUMBERS, for Grade Three
FOLLOW THE SIGNS, for Grade Four
ARITHMETIC TOOL CHEST, for Grade Five
HOW AND WHY OF ARITHMETIC, for Grade Six
ARITHMETIC IN ACTION, for Grade Seven
ARITHMETIC AND LIFE, for Grade Eight

And don't neglect

THE IROQUOIS NEW STANDARD ARITHMETICS, Enlarged Edition

By PATTON & YOUNG

A favorite arithmetic series, now enriched with abundant additional drill material

and

THE IROQUOIS NEW STANDARD GENERAL MATHEMATICS SERIES

By PATTON & YOUNG

A sound and well-balanced series for the junior high school grades

IROQUOIS PUBLISHING COMPANY, Inc.

HOME OFFICE: SYRACUSE, NEW YORK

New York Chicago Atlanta Dallas

Dragging—*A* Problem Unit

By ETHEL F. COLLINSON

Grade 6, New Governor Bradford School, Provincetown, Massachusetts

IN discussing the different things which we could develop as a problem unit, my 6th Grade thought a unit on what it would be like to be a dragger fisherman would be interesting, since so many of their fathers, brothers or uncles were, and dragging is by far the most profitable way of fishing at the present time.

One boy had been with his father dragging, all last summer, so he could give us a great deal of information first hand.

In the event some one does not know what a dragger is, I would say that it is like an ordinary fishing boat, but attached to the mast (which is a little to the forward part of the boat) is a boom which projects out over one side of the boat. To this is attached a large bowl-shaped weighted net, one-half to one mile in length, and held in place by wires around the top sometimes 25 fathoms in length, depending upon the depth of the water in which they are fishing.

This bag or drag has openings at the bottom like doors. When they begin dragging, the net is lowered over the edge of the boat to the bottom of the ocean by winches, while the boat continues to move.

The net scoops up the fish as it moves through the water. After a certain length of time, perhaps 1½ hours, the net is raised and the fish are dumped into the hold of the boat.

When not in use the drag is folded back against the boom.

On large boats there are often two nets or drags; one on each side of the boat.

It was decided to choose an average sized dragger.

Both boys and girls worked on the general information, then the girls took over the food end of it and found the cost from the stores, of all articles of food taken on a trip. The boys carried on the rest. We first listed the general topics and questions which they decided we should know. These were assigned to different groups to investigate. None of us realized what a lot of work this involved.

The children had to interview the fishermen to find out these things, then compare, sum up the whole thing and take an average, as there was quite a variety of kinds and sizes of boats and methods of figuring the trips.

Some boats figure expenses each trip and pay the crew at the end of the trip. Others do this weekly or monthly. On some boats the shares are divided differently; for instance the captain who is also the owner, may receive his share plus 33-1/3% or 40% of the boat's share. We tried to take an average boat and the most typical way of figuring.

As they went along, I too, had to check on what they found and on the whole their information was very accurate and reasonable.

The following are some of the topics:

I Size of boat and number of men, shares, and how divided.

II How far and where the draggers go, how long they stay.

III Length of time of drag, how many times they drag on trip.

IV Typical or fair-sized haul.

V Current prices, kinds of fish, difference in price between Provincetown, New Bedford, Boston and New York.

VI Expense of shipping, cost of ice, boxes, etc.

VII Other expenses, food, fuel, gloves, etc., deductible from amount of intake.

This is what the children found.

The father of one of the boys owns and is captain of a 40-foot boat, which is an average size. The crew consists of five men including the captain. The number of shares varies with the length of the boat. In this case each man has 1 share and the boat has 3, making a total of 8 shares. The captain receives the boat's 3 shares plus his own 1 share, making 4 shares or one-half the intake of the boat.

There are several good fishing grounds depending on the kind of fish desired and the size of the boat, and the distance to travel. They finally decided on Nauset and Highland Light—18 miles from Provincetown —for the whiting season, as both New Bedford and Provincetown were accessible from these points and not too far for the size of the boat. Also it is here that the whiting first start to run and gradually work into Provincetown Harbor by Race Point, so that at the end of the whiting season they would be fishing near home. The whiting season begins the first of May and ends about November . They can drag for other fish all the year round, weather of course permitting.

The draggers have found that by going direct to New Bedford with their catch they get a better price, 3 to 4¢ more a pound, which sometimes makes a difference of $500 to $600. Also, they do not have to pay for shipment which is a big item, ranging from $4 per 175 lb. box to Boston, to $6 per box to New York.

At the time of this writing whiting were bringing 5½¢ a lb. in New Bedford and only 2½¢ in Provincetown.

We worked out a problem on the above to see how much could be saved. It was decided it would be better to take them directly to New Bedford.

In determining the cost of food for a week the girls started with the menu. They found that all fishermen like to eat well and have the best of everything, and plenty of it. Also, they found that on most boats they have two hearty meals a day with "snacks" in between. These things the girls found out by consulting the fishermen personally. Then they found the cost of the articles by consulting their mothers or the storekeepers; they found that it would cost about $30 per week for each man, or $150 per week for the crew of five men.

The following is a typical menu:

Breakfast

Bacon or ham, and eggs
Fried potatoes
Bread and butter
Coffee
Cake or pie
Fruit or juices

Dinner

Smoked shoulder
Potatoes
Cabbage
Pickels
Bread and butter
Coffee
Cake or pie

These are varied by using beef stew with vegetables, frankfurts and beans, roast beef, roast lamb, corned beef, etc. Plenty of coffee and beer is served with and between meals, also cookies, cake and fruit.

After the girls had finished their research work on foods they decided to let the boys finish the dragger problem while they started another unit. The boys continued and worked out a typical problem to cover a week of fishing.

When they drag for whiting, they have to land them every day, as they will not keep. Most captains settle their trips by the week.

A typical week would be a 15-hour day for 6 days, for whiting; for haddock, 3 days and 3 days—landing fish every third day.

Taking the whiting, as the season is now on—they drag for 1½ hours and about 7 times in the 15-hour day. The drag can average from 1,000 to 3,000 pounds, about 14,000 pounds a day, 84,000 pounds a week. Of course there are some stormy days when they cannot go out.

The expenses for fuel oil, food, church ($25-50) are taken from the amount received for the week. The amount for church is decided upon by the captain and crew. On a boat of this size they average $14.40 a day for 100 gallons of fuel oil, and $3.50 a day for cylinder oil ($17.90 a day for fuel and oil). The balance is divided into 8 shares, 3 for the boat and 1 for each member of the crew. Each man's withholding tax is deducted from his share according to his dependents. Also, on a 40-foot boat or over, 1% Social Security is deducted for each member of the crew and the owner.

A typical problem follows:

PROBLEM

Typical Week's Haul

84,000 lbs. whiting
x .05½¢

42,000
420,000

$4620.00
- 300.00 Deductions for Expenses

8)$4320.00 Intake

$ 540.00 Each Man's Share

Expenses

$ 17.90 Fuel per Day
x 6 Days

$117.40
150.00 Food

$267.40
32.60 Other Expenses, Church, etc.

$300.00 Total

We found each man's share was $540.00 minus $5.40 for Social Security, leaving him $534.60

$540.00
x .01

$ 5.40 Social Security

Taking a man with three dependents and using the table and the weekly payroll period we find that if the wages were $200 or over we had to find 15% of the excess over $200 plus $24.10 for three dependents. This, deducted from the man's share gave him $459.31 to take home.

Withholding Tax and Social Security

$540.00	Each Man's Share
- 5.40	Social Security
534.60	
-200.00	
334.60	Excess over $200
x .15	
$ 50.19	
24.10	For 3 Dependents
$ 74.29	Withholding Tax
$534.60	
-74.29	Withholding Tax
$459.31	Amount received to take home.

A boat can be bought by an experienced dragger fisherman by paying a certain amount and getting a loan for the rest, like any other property, as a boat is expected to pay for itself in a few years. A 40-foot boat today costs over $30,000 all equipped.

The average year's pay for a crew member at the present time would be from $3,000 to $5,000 or more. We discussed how much they should set aside for living expenses (which entailed a lot of planning and research) and what could be put aside towards the purchase of a boat of their own. They decided that at least $2,500 should be used for living expenses and if they received $5,000 they could save $2,500 a year towards buying the boat. If they put this in the bank with interest at 2½% (which they found out and we worked out the simple interest) in 10 years they could pay for the boat.

(1) We used the four fundamental processes over and over again—and we did enough simple percentage and interest for them to see what it meant. It also brought geography, map reading—to locate different fishing grounds, and an insight into the actual cost of living, and some of the problems that have to be faced in life.

(2) It has been a most interesting and educative unit. The children have learned how to go after the information they needed. Many of them had no idea of the hard work dragging entailed. To them it was "easy money."

It helped them to better appreciate and evaluate the type of work that we just take for granted.

A Healthy Breakfast: *A* Functional Problem Unit

By MARY ELLIS
Sixth Grade Teacher, Chatham, Massachusetts

Food, a breakfast, provides the basis for this *general* functional problem unit at the third grade level.

THIS functional problem unit, "A Healthy Breakfast" arose in a study of health.

We discussed menus for breakfast, lunch and dinner, and food values. In many cases we found that prices, and not food values determine the menu. What are the prices of different foods that we serve for breakfast? I asked the price of milk, fourteen out of twenty-two knew; juice, cereals, eggs, and fruit, less than half the class knew; bread, eighteen out of the twenty-two knew; butter, nearly everyone responded. One girl said, "Why my father can't even buy a pound of butter and loaf of bread for a dollar." (evidently prices of butter had been discussed) This led to the cost of a substantial breakfast for children,—but how were we to determine it? A quick response from several was that the best way would be to serve one. Would that be possible? As suggested a committee of three was chosen to meet with Miss Stevens, our household arts teacher, to discuss this problem, and to report. Within two days the committee reported their interview as to healthy breakfast menus, and that it could be really served in our school cafeteria very soon.

As there are only twenty-two in the class, each pupil was assigned one article on which to report the price, size, weight, etc., at a special store. The next day each pupil reported about his assigned article. Bread was discussed first—the kind, weight, number of slices in a loaf, amount needed, and the cost. Orange juice was found to be of many brands, and sold in number one and number two size cans. The number two size containing about four servings, while the number one cans would serve eight people. Prices varied according to brand and size. The prices of eggs had to do with their condition and size, (large, medium, and small.) As they were going to be poached, it was decided that two dozen of large ones would be the best. One pound of butter was needed. Here again the price varied acoording to the brand. The amount of a large "Quick Quaker," a half pound of cocoa, and two pounds of sugar, completed the list. The price of each article to be served, was written on paper and the total cost found. After which they divided it by the number of pupils plus one (the one signifying the teacher) and found that each pupil was to contribute twenty-five cents. Whereupon one ambitious pupil suggested that each earn his money.

Many did not seem able to secure work so a sign was posted in the school corridor which read,

WANTED: Work by the sixth grade. Several obtained work through this ad, and the question of earning money was settled. I received reports from their employers who stated that the work was well done, and one employee was given a steady job.

The following week the money was brought and the class divided into groups to purchase the food at the different stores. It was deemed wise to add the amount of our purchases and to count the change. The treasurer who had been appointed, collected the money and gave each group of purchasers a certain amount when they went to the store. Upon their return the amount paid and the change were checked.

On Thursday morning January 29th the girls were given instructions as to the proper way to set the table, and the boys as to the clearing away.

Each pupil had made his or her place mat, and one girl volunteered to make an extra one for the teacher.

At 9:30 on the above date, the breakfast was prepared and served by our household arts teachers and one of her classes. The menu consisted of orange juice, a generous serving of oatmeal, buttered toast, poached eggs and cocoa. It was "deelicious" and everyone enjoyed it. I induced one boy, who never ate warm cereal, to try a little of the oatmeal, and was surprised to hear him say, "My mother doesn't cook it like this. Boy! is this good!"

After school I happened to encounter one of the fathers. He said, "Do you know, Mrs. Ellis, my daughter hasn't ever eaten breakfast, except for a glass of orange juice. She sure did a job on that one. There ought to be more of it."

Through this small unit, not only food prices, totals, values and real life situations have been met, but a real new family has grown out of it, with a better understanding of one another. It has given the slower ones a real job, and shown them that they really have a part in this great universe of ours. Living together, working together, the makings of a good citizen. "School work that doesn't come close to the lives of the children is of doubtful value."

To Be Published March 1

MEANINGFUL vs. MECHANICAL LEARNING

A Study in Grade III Arithmetic

By

WILLIAM A. BROWNELL, HAROLD E. MOSER and Others

$3.00

DUKE UNIVERSITY PRESS ✦ Durham, S. C.

Sketches *of* Functional Problem Units

By MARY A. SHEA
Assistant Principal, Henry F. Anthony School, Portsmouth, Rhode Island

THE following detailed units and suggested units were developed by teachers in the primary and intermediate grades. They are hereby presented that they may be of some assistance to teachers desirous of presenting functional problem units in their classes.

1. *A Fruit and Vegetable Store*:

This unit was carried on in a third grade class. Real fruits and vegetables and real money were used by the children in working out their problem. On the first day, Bennie was the salesman and the customers were Helen, Clara, and John.

Helen purchased:

4 bananas @ 7¢	$0.28
6 oranges @ 50¢ per doz.	.25
1 lb. carrots @ 9¢	.09
1½ lb. tomatoes @ 20¢ lb.	.30
TOTAL	$0.92

As a check, Helen added her money in the pile which she had made as she purchased each article. She then went to the board and added the amounts of her purchases. Both checked with the salesman's account. Helen presented the exact amount of money in making her purchases so that it was not necessary for Bennie to make change.

Clara purchased:

1 pkg. Quaker Oats @ 32¢	$0.32
½ lb. butter @ 76¢	.38
1½ lb. sugar @ 10¢	.15
TOTAL	$0.85

These half portions necessitated division. The first step in division was to divide the money in Clara's pile. Clara gave two quarters and four dimes, making ninety cents, to pay her bill. Bennie subtracted 85 cents from 90 cents and gave Clara 5 cents change. Now Bennie and the class checked. Adding the account and then subtracting, the account was verified.

John purchased:

2 lb. potatoes @ 20¢	$0.40
½ doz. eggs @ 84¢	.42
1 lb. onions @ 9¢	.09
TOTAL	$0.91

John checked his pile of money which he had and made at each purchase and then entered each pile in a column on the blackboard. Both checked .91 cents. At first he had 61 cents for an answer and had to check all over again. When John found that the board work and his pile of money differed, he decided that he must be more careful when using figures.

Nancy purchased:

5 lemons @ 5¢	$0.25
4 bananas @ 7¢	.28
3 grapefruit @ 3 for 25¢	.25
TOTAL	$0.78

Nancy gave Bennie a half dollar and two quarters in payment for her purchases. Bennie gave Nancy 22 cents in change. The children learned here that five 5's are 25 and they also learned to count by 5's. The boys and girls could now see the need for knowing their multiplication facts. Keeping store stimulated interest in learning their number combinations, but chiefly and primarily it provided motivation, understanding, and knowledge of business.

One little second grade girl asked to be a guest at the store counter. After the class had finished the sales for the day, she gave up a part of her noon hour to voluntarily learn number facts. The store experience had fascinated her.

As the sales were being conducted, the pupils tried very hard to keep the amounts of the various purchases in mind. The money combinations were giving a new and vital meaning to number combinations for these children and they could readily see the necessity of checking their number work carefully. They realized that they must be careful in their arithmetic because they would need to use it all through life in handling the money which they would earn.

2. *Valentine Sale*—Grade 1 and 2

This activity extended over a period of two weeks, starting the first of February and having its climax the day before Valentine's Day. Its purpose was to provide certain experiences by means of which the child's knowledge of and interest in numbers might be extended.

Valentines of several designs were made by the class during seat work and free time periods. Posters advertising the sale were made and posted in conspicuous places about the room. Folded paper purses were made and pennies made from circles of brown paper, stamped "1¢" with the rubber stamp. Each purse contained ten pennies. Covers of cardboard biscuit boxes were used as trays for holding and displaying wares. These were arranged on a long table. Price tags were attached. Samples were arranged in the "shop window" (bulletin board) conspicuously priced, each tray and its price tag fastened at the back edge.

On the day before Valentine's Day the sale was held. Each child came with his purse full of money to buy valentines. They chose the ones they preferred, were waited upon very courteously by the sales force, and counted out the correct number of pennies. Each valentine was purchased separately and paid for as it was purchased in order to avoid the necessity for guessing at the addition combinations which they did not know.

After the sale was over we "took stock" of our purchases and the money we had left. The valentines were addressed and sent to children in the kindergarten and to neighbors.

3. *The Flower Shop*

Grades 3 and 4

A. *Pupil's Aims*—To select two or three plants with correct prices of each. To add to find total cost of plants bought at shop. To find amount of change received when presenting a bill in payment.

B. *Teacher's Aims*—To find correct cost by addition of dollars and cents. To balance to find out amount of change received, thereby bringing in both addition and subtraction of

dollars and cents. Careful arrangement of material in work book.

C. *Materials Used and Sources of Supply*—Two large sheets of brown paper were pasted, one onto the other, to make one long sheet. Children colored and cut out jonquils, crocuses, primroses, Easter lilies, narcissus, and hyacinths. These were first dittoed on paper by the teacher. The children colored and cut out flower pots. The flowers were arranged in pots, making attractive plants.

After drawing lines on the brown paper to represent shelves, plants were pasted on the shelves, thereby making five rows of plants. Prices were printed on the shelf beside each plant. Correct prices were obtained from a nearby florist.

D. *Mode of operation*—The pupils selected two or three plants with correct prices. These were neatly written in a work book kept for short units. The total cost of plants was figured. Later the children found out how much change they would receive from $2.00, $3.00, and $5.00. Each purchase was illustrated in the work book. This was not a long unit and a new problem was begun when interest began to lag.

Other Units—Used in last three years:

Grades 1 and 2

- Grocery Store
- Post Office
- Automobile Registry
- Cost of decorating Christmas Tree
- Toy Store
- Umbrella Sale
- Paper Doll Fair

Grades 3 and 4

- Vegetable stand
- Post Office
- Restaurant
- Height and weight (gain per month, per row, per room, per building)

Grades 5 and 6

- Vegetable garden
- Cost of spring outfit
- Magazine and paper store
- Cost of Thanksgiving Dinner
- Cost of class trip
- Budgets (family, individual, camp)

GENERAL SURVEY TESTS IN ARITHMETIC

Forms 1 & 2

By GUY M. WILSON, Ph.D.

These tests cover the four fundamental processes in arithmetic including a section on business judgment. They have been used in many school surveys to inventory and diagnose difficulties in arithmetic teaching. The proper use of these tests and the Wilson Inventory Diagnostic Tests in Arithmetic advertised on page 326 will raise the standard of your arithmetic teaching.

Price $1.00 per hundred

THE PALMER COMPANY

370 Atlantic Avenue **Boston 10, Mass.**

"Thrift"

By OTTO E. NICKERSON
Grades 6, 7, 8, Eastham Grammar School,
Eastham, Massachusetts

NOT long ago our new Superintendent sent letters to each of his schools asking that we as principals and teachers watch the possible avenues of waste in the use of paper, pencils, crayons, school books, etc. We have had many talks and discussions about this with our pupils. Another place in which we have tried to watch thrift habits is in our lunch room. There each one is served the very same plate of food. We realize that all foods do not appeal equally to all people, so we have encouraged the clean plate idea, even to swapping if it would otherwise lead to waste.

Care of our clothing at school and at home has been stressed. Everything is shaken as dry as possible after a snowy recess, and coats and ski pants hung up—not dropped at the bottom of the lockers; the wearing of rubbers, overshoes, and boots during wet weather to save our shoes; and thought of damage to clothing in playing such rough games as football. Even the stamping and cleaning our sandy feet on the rubber rugs in entering the corridor on warmer days has been encouraged to save wear and tear on linoleum and school room floors.

Then came our posters for New Year's resolutions, and every one gave much space to thrift with money savings ranking first. We also wrote compositions on "How We Can Be Thrifty," and these brought out: 1—money savings, 2—food economy, 3—our own time, 4—care of clothing, 5—care of home and school, 6—collecting and saving newspapers and magazines to sell, 7—to take care of all our things so that they will last longer, and when we are through with them to give them to other boys and girls who can use them.

From this we discussed the idea of a possible systematic school saving each week. Next came the discussion, "Why Save?" Here the teacher tried to take the long range view of preparing for days and years ahead—today's ice cream or tomorrow's book or something equally as enduring; being careful to safeguard, clean and press clothing so that its longer usage can give the whole family an extra special treat—a sharing of thriftiness! The teacher must continually point out that waste never accomplishes anything while thrift is always rewarding.

For the past few years our school has been buying its war savings stamps with each one working to purchase his bond. Now in 1948 we have contacted the only savings bank in town, the Cape Cod Five Cents Savings Bank of Orleans, and it has agreed to accept our school's savings project if we of the upper grades will assume much of the responsibility that would otherwise require the time of a bank official.

Our plan now at work is as follows:

Tuesday has been designated as Bank Day (we find that Monday coming at the end of a week-end is not as

good a day as Tuesday, when one can give the reminder before the close of school on Monday). Each one brings in whatever he feels he can save. We stress that it isn't how *much* but how *often* we save. Each week, by turn, three "bankers" are chosen to take charge of the deposits for the three rooms. My Sixth Grade assumes responsibility for the little folks with the smaller savings in the Primary (Grades I and II); My Seventh Grade takes over the Intermediate room consisting of Grades III-IV-V, and a member of Grade Eight has charge of our own room which has almost as many members as the other two together.

A school deposit book has been issued by the bank to us. This is a small yellow book and takes care of savings up to one dollar. The school secretary or banker does all the clerical work in this book. Then when the sum of a dollar is reached, the book is sent to the bank where a regular blue pass book is issued to the depositor, and his first dollar then goes on interest. This blue book may be kept on file at school or taken home as its owner desires. The real functional arithmetic comes about on Tuesday morning when each "bank official" must collect, record, add, and check to the teacher's approval the amounts brought in from each room. If the one in charge cannot make his accounts balance, his entire class joins to give him the assistance needed. (So far this has not been necessary.) When everything is properly balanced in the three rooms, the money, slips, and books are filed away until after school when I take the three "bankers" (if they can all go) directly to the bank to leave the day's work in banking. (Mr. Lake, the treasurer, has us come to the side door which he opens for us, as it is after regular hours before we can get there.)

The sixth and seventh graders are learning valuable lessons in ordinary interest. We discuss the value of money and its effect upon our daily lives. The eighth grade is now working on compound interest tables, and can readily see its applications in their own books. The example in the chapter on "Percentage and Interest" in "Teaching the New Arithmetic" called "Aladdin's Magic Lamp of Money" has been figured and viewed with awe, and I know that compound interest has been driven home to them by this example in a most vivid way. Here I have also tried to teach that understanding a table in interest is of much more value than countless hours of wasted time in figuring, figuring, figuring.

Our art problem this week will be making a chart which will show each individual's score in weekly banking, and also the percentage of depositors in each room. A thrift banner, donated by the bank, will be hung during the following week in the room standing highest on the chart. We feel that in our school too many children spend too much money on movies (usually poor ones, too!), ice cream, and candy. We hope by precept and wise (though not *too* pointed) teaching to divert a substantial portion of this into a foundation fund for their future.

Functional Mathematics *in* High School

By E. J. DAHILL

Mathematics Teacher, Provincetown High School, Provincetown, Massachusetts

BECAUSE Intermediate Algebra and Trigonometry are offered in alternate years at the Provincetown High School, the classes are composed of Juniors and Seniors. It is evident that approximately one-half of the class is a carry over each year. This carry over lends continuity which is a main factor in the effectiveness of the functional aspect of our mathematics program.

How We Got Started

The Town Athletic Field was a WPA Project that was never finished. Although it was used for base ball, a public play ground and the out-of-door gym classes from the High School, there were patches of dense brush, sandy stretches of varying sizes and shapes, and it was far from level. Two years ago the Town appropriated $2000 to fix the field so that it would not be hazardous for the children to use.

The Committee in charge of the appropriation tried to get a surveyor to establish a finished grade for the field and to ascertain the quantities of materials required to achieve this. The surveyor's fee was quite high, so I was asked if I could do the job. I have had considerable experience in surveying so I agreed to do it with the aid of some of the students in the trigonometry class. When the class members heard of the plan they all evidenced so much interest that it was decided to make it a class project.

What The Students Did

We went out to the field during the regular class period and decided to work on a section three hundred by four hundred feet because this would fill the immediate need and also, a rough estimate indicated that this area would more than use all the money available.

The next day we borrowed a surveying instrument from Frank A. Days, a local contractor, and spent the class period familiarizing the class members with the operation and adjustment of this highly accurate and sensitive instrument. The home work consisted of a review of the sections of the algebra and trigonometry books on profiles and coordinates.

On the third day we picked a survey party from the members of the class and laid out the field. The accompanying diagram shows how the field was staked out with numerical coordinates running in one direction and alphabetical coordinates running at right angles to these. This gave us a series of small sections which could be located either in the field or on paper. The distances were taped with a metalic tape and the angles turned off with the instrument

with occasional diagonals to insure accuracy.

On the fourth day we established an elevation which would be satisfactory for the finished grade of the field and took elevations with the instrument at the intersection of all coordinates. These elevations are represented on the diagram by figures above the horizontal lines, and the finished grade elevation of the entire field has a numerical value of five.

On the fifth day we calculated the quantities of materials required by sections. These quantities are in cubic feet and are represented on the diagram by figures below the horizontal lines. The total amount was converted to cubic yards as this is the unit of measure used in purchasing clay and loam. After consulting the Massachusetts Department of Public Works and local landscape gardeners we ascertained that three inches of loam was required to hold sod in our particular locality. To cover our field to this depth with loam would take eleven hundred cubic yards and to fill the low spots another fourteen hundred cubic yards of clay. This data is graphically illustrated on the accompanying chart.

The Committee, in the meantime, had received bids on materials and had decided to accept one offering either clay or loam at two dollars per cubic yard delivered. By consultation with experienced persons the students arrived at the fact that labor and other incidentals such as grass seed would cost seven hundred and fifty dollars, therefore it was a simple matter to figure that we could only buy six hundred and twenty five yards of clay and loam.

We then went back over our diagram and decided to do the area within a radius of three hundred feet of home plate as illustrated on the diagram. This filled the immediate needs and we also had the facts as to the amount of money necessary to finish the job. On the basis of these figures the Town appropriated enough money at the next Town Meeting to finish the job.

The engineering for the second year's work was done by the Intermediate Algebra class, which, as explained above, was composed in part of members from the preceeding year's Trigonometry class. These students proved capable not only of doing all the work themselves, but they also directed the efforts of the new members of the group and brought the project to a successful completion with no direct aid from the teacher.

A unit involving the local airport was a direct outgrowth of this Athletic Field unit. Last year the Town built a new airport and when construction started the class evidenced considerable interest and wanted to go out to observe the surveying. After the surveying that they had done they considered themselves experts. When we got out there they were delighted to see that the fundamentals which they had learned on the ball field held on airports also and that quantities were figured in the same manner.

On our first trip the students took the engineer's transit and marked grades on a series of stakes. Joseph Adams, the resident engineer in charge for Burns and Kennerson, the engineering firm who did the paper work and also supervised construction, was amazed that a group of high school students could read blue prints and actually transfer the data to the field.

He invited the class over to the field laboratory to show them more practical engineering.

When the students saw the apparatus used to test the soils being used they wanted to try operating it. As it is quite an involved procedure, we made an appointment with Mr. Adams for another day and in the meantime he gave the students literature on the subject so that they would have an insight into what they were after.

The entire soil testing procedure is quite involved and technical to explain here, but I will attempt to summerize what the students did. There are two main parts to the program, finding how much material can be packed into a given volume and also finding the moisture content of the compacted mass.

The first test consists of pouring the materials to be used into a metal cylinder and dropping a hammer into the pipe systematically until no more material can be jammed in. This material is then removed and weighed. The same material is then cooked over an oil stove to drive off all moisture. Subtracting the weight of the dry material from the weight of the wet material gives the weight of water driven off. Now the proportion of wet material which is water can be figured, and repeated tests indicate the proper amount of moisture to arrive at the greatest possible compaction. Once the moisture content that is most desirable is ascertained, samples are taken at regular intervals from the runway and tested in the laboratory.

It is evident from this brief description of the process that considerable work is entailed, work that is exacting. Mr. Adams organized the class so that each member had a job and the students got so interested in their work that when it was time to go back to school they asked if they could stay for the rest of the afternoon and finish the section of the runway that they bad started on.

Number Experience Outcomes

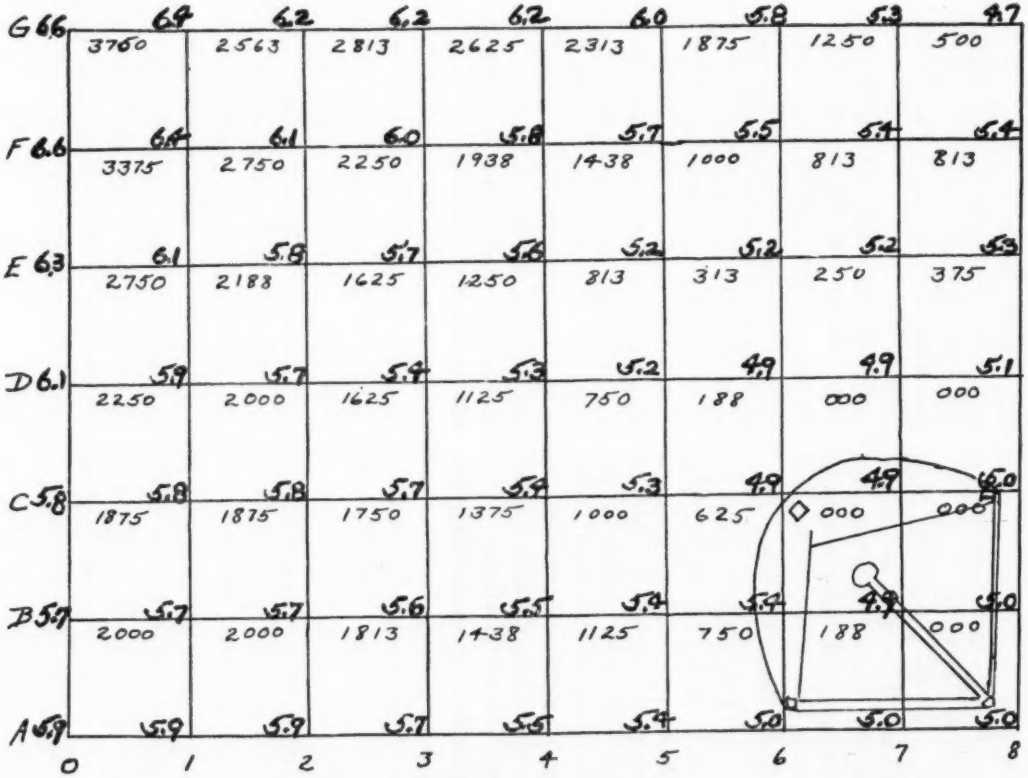
The practical applications of mathematics in these units were many and diversified.

1. Spatial relationships in picturing the finished job and methods of attaining it.
2. The use of plus and minus numbers in recording elevations as above or below a fixed base line.
3. Estimation of quantities.
4. Accurate calculation of quantities
   a. area
   b. volume
5. Use of coordinates
6. Use of slide rule.
7. Use of lograthims.
8. Relationship between dollars available and quantities of materials required.

Helpful Carryover Into Other Fields and Subjects

From the ball field unit the students achieved an understanding of the problems and effort that someone must go through in order to provide just a small part of the school athletic program. They also became conscious of the need to protect public property as they had to correct abuses of the field and they saw that this cost money in terms of material and labor.

From the airport they realized how carefully even large sums of public money are spent. Also, the cooperation between local, state, federal and Civil Aeronautical representatives as



PROVINCETOWN HIGH SCHOOL ATHLETIC FIELD—FINAL REPORT

Figures above the horizontal lines show relative elevations with 5.0 desired finished grade. Other figures show quantities of material needed in cubic feet.

SUMMARY

Total material needed 2500 cu. yds.

Total area 13,333 sq. yds.

3″ of loam—1100 cu. yds.

Balance clay 1400 cu. yds.

Total 2500 cu. yds.

well as engineers, contractors and labor that is required to accomplish a job. They also got a good idea of the advantages and disadvantages of various types of employment. For instance, one rainy day they noted that the labor force were knocked off while the administrative forces still were getting paid. This brought out the fact that although truck drivers and bull dozer operators get a good hourly wage, they only get it while they are working while the administrators get paid regardless of weather.

Determining the amount and kind of grass seed to be used on the ball field entailed a good deal of botanical work. Making stakes for surveying entailed the use of the power tool equipment in the school shop.

Evaluation

Being able to put their mathematics to a practical use where they could view the results resulted in more intense and widespread interest in the whole field of mathematics. Once they work on a unit such as these the students want more mathematics and the chance to use it practically.

The number of students taking the traditional mathematics program has increased by 50% since this program of functionality was introduced and this is entirely on an elective basis. That the students were really interested is evidenced by the fact that after we got started on surveying they insisted on working afternoons as well as during the regular class periods.

Mastery of mathematics is also promoted. On the basis of Metropolitan Achievement Tests, which are given each year, the classes are well above the New England average—the average percentile grade for the past three years is 75.

This program has also crystalized vague leanings as regards vocational choices. Ninety percent of the students going on to college have chosen engineering of one type or another and at least one of the girls is studying to be a laboratory technician.

Although it takes a great deal more time than the book and book-problem method of teaching these branches of mathematics, it is pleasant work for both the teacher and student, is conducive to more natural teacher-pupil relationships, and certainly promotes and holds student interest.

Discovering Problem Unit Readiness

By ELIZABETH RAY
Lincoln School, Melrose, Massachusetts
AND
GUY M. WILSON
Boston University

THE problem readiness test shown herewith is not exactly a test nor is it a scale, but it might be presented to pupils as a test since they would not understand a more discriminating term. The purpose is not to test children, but to discover the experience or background of each child in order to see what problem units he is ready for.

In the test shown most of the items relate to information involved in general problem units, food, clothing, shelter, and other phases of the family budget. To discover a child's readiness for a special (vocational) problem, such for instance, as poultry for egg production, special questions would need to be prepared. If a child has no experience basis for a poultry unit and has no intention of acquiring such experience, then obviously a poultry problem unit would be inappropriate for him.

General problem units relating to phases of the family budget should be pursued by all children; the problem readiness test is used to help determine *when* or *at what level.* Special problem units are appropriate only when the community provides a background for the unit, and with children interested and sufficiently mature for the unit.

Poultry for egg production would not be a good problem unit for city children with no direct connection with the elements of the problem. They could not use judgment, and business judgment is the real objective of a problem unit in arithmetic. All of the essential elements must be involved and properly evaluated. The answer or conclusions must be right from the standpoint of best practices.

When this test was given to a fifth grade, Wilbur was the only one who knew the charge for a doctor's house call. When he was asked how he happened to know that, he replied that his father was a physician. I should have known that, but I didn't. But the class immediately chose Wilbur to be chairman of the health committee for the family budget.

On questions 9 and 18, James was

Problem Readiness Test

Grades 5 and 6

1. About how much can you save by buying vegetables, canned goods, and other foods supplies in quantities? _____
2. After what hour are the telephone rates reduced? _____
3. How much does it cost to send a letter to Washington, D. C.? _____
4. How much does a $25 War Bond cost? _____
5. How much do doctors charge for a house call? _____
6. What is the cost of a pound of butter? _____
7. How much do we pay for chocolate milk at school for one week? _____
8. What is the cost of a pair of shoes for a 10-year old boy? _____
9. How many gallons of gasoline can you buy for $1.00? _____
10. If you were able to get one, about how much would a boy's bicycle cost? _____
11. How much does a loaf of white bread cost? _____
12. How does one endorse a check? _____
13. What is the size of the bottle that school milk comes in? _____
14. How much does it cost to send a money order for $3.00? _____
15. About how much should be spent weekly for food for a family of 5? _____
16. What degree on the thermometer represents freezing? _____
17. What is the average fare per mile on the railroad? _____
18. About how many miles can a medium-weight car run on a gallon of gasoline? _____
19. Which is cheaper to send, a day telegram or a night letter? _____
20. How does the government raise money for expenses? _____
21. How much rent should be paid for a 6 room house? _____
22. How many pounds are in a large size bag of flour? _____
23. When is the next Leap Year? _____
24. How is electricity measured? _____
25. For what do the numbers on the radio dial stand? _____
26. What is the cost of a winter coat for a 12-year old girl? _____
27. What is the cost of a pound of the best hamburg steak? _____
28. What salary does the President of the U. S. receive a year? _____

the best informed, and the suggestion followed that any questions on the family income necessary to justify the ownership of a car, be referred to James.

These are typical. One pupil's mother worked at the telephone exchange. Another pupil had worked around a grocery store, and knew about losses on fruit and vegetables and therefore why prices on these items were high.

A unit on the family budget must be a grass-roots study; it must involve the children and their home experiences fully (without revealing any embarrassing aspects of the same). The family budget unit is basic for all children and can be undertaken as lowly as the fifth grade.

They're Never Too Young

By HERBERT S. ZIM
Science Consultant, Ethical Culture Schools,
New York, New York
and Manhasset Bay School,
Port Washington, New York

THE spectrum of science teaching runs from the ultra-violet of the university graduate down to the infra-red of the lower primary grades. It has been my good fortune recently to explore the lower range, working with 7, 6, and 5 year olds and sometimes with 4's and 3's. Moving down the spectrum from level to level, clearly showed that children could understand, assimilate, and use far more science than the classroom teachers or I, as a specialist, suspected. This science had to be pertinent to situations and events that concerned young children, but since these have included radar, electricity, food, steam engines, atomic energy, and airplanes as well as many aspects of plant and animal life, we have learned that scientific interests of young children may be almost as broad as those of adults—and a good deal more active.

Such a program of science education could not assume a fixed, subject-centered curriculum, and as a preferred alternative, it centered on the use of scientific facts and methods to solve appropriate problems which had meaning to young children in a variety of situations. In these situations science stimulated and demanded more quantitative thinking than had previously been needed. Mindful of colleagues' warnings about "pushing arithmetic" (our formal instruction begins with the 8 year olds, though some readiness work is done with the 7's), primary teachers began to look for ways in which the more significant classroom activities could develop quantitative aspects.

Emphasis was placed on significant activities, since teachers have always used some number work with 5, 6, and 7 year olds in matters of counting supplies, making up teams, keeping the calendar, telling time and the like. These incidental activities have a place in a functional curriculum. But what about quantitative thinking, measuration and related techniques in building stores, boats, or trains, growing plants, raising animals, and other major undertakings? To start off, teachers began to observe critically the use children this age made of numbers.

All 7 year olds and most 6's could count to at least one hundred at the drop of a hat. Many could count by 2's, by 5's and 10's. Numbers like hundreds, thousands, and millions are common in their conversations. Here was an impressive verbal use of numbers, though the curriculum only stressed simple functional counting. Part of the explanation lay with parents, who remembering the recitations they used as children to impress visiting relatives, were substituting for the same effect some surreptitious home-

work in reading and arithmetic. Then, too, the children's city environment brought them in daily contact with many kinds of numbers.

But most of these numbers meant about as little to the children as a recitation from *Hiawatha*. Though each child knew his address, few 7 years olds knew what an address meant. A boy who could quickly tell you he lived at 54 West 74th Street, would not know when asked on what street he lived. Nor was there any recognized relationship between 63rd and 74th and 96th Streets, even though each individual could count through those numbers rapidly. Children who could count by 2's glibly had no better understanding than others in the group of the scale of a thermometer, graduated in two degree units. Some 7 year olds who had measured the height of their classroom, 13 feet, in order to know the maximum size derrick they could build, variously estimated the height of the six-story school as from 500 feet to a mile.

Without altering their educational approach, teachers began to focus more attention on quantitative concepts, and on experiences into which such concepts could fit. When the 7 year olds built a grocery store, an old-fashioned scale and a set of iron weights were provided. In their first exploratory experiences children quickly observed that two one-pound weights on one pan of the scale balanced a two-pound weight on the other. They tried and worked out many other combinations, using 1, 2, and 5-pound weights. They used the 1, 2, 4, and 8-ounce weights and soon discovered that 16 ounces made a pound. The group developed working concepts of a half and quarter pounds also. Other measurements came into the picture rapidly and ideas of dozens, pints, quarts, took their place with a functional use of pounds and ounces.

Furthermore, the success of "real" scales in the store created a demand for "real" money which made more counting and some simple sums possible. All these activities which became so real to the children formed a basis for beginning reading. Children dictated a number book and a money book, summing up the facts they learned.

Another group of 7 year olds became interested in stamps one boy brought to school. The teacher directed their attention on the denominations, and from that interest developed a class post office. Not only did stamps for first class, airmail, and special delivery involve numbers, but children began to bring in envelopes of letters that parents received. They were able to make a rather simple map of the country, marking New York on it with strings running out to the cities where the letters originated. Rough figures of the distances—Albany 150 miles, Washington 250 miles, St. Louis 1,000 miles—were added. With these growing concepts of distance, came corresponding concepts of travel time by train, and by air. These activities coupled with a visit to the post office, selling stamps, learning the local zone numbers, and writing postcards to one another rounded out a series of rich and enjoyable experiences.

These two brief examples show the types of activity that flourished. Each was normal for the age group, yet enriched quantitatively. There were also many subsidiary occasions for using measurement and numbers. One

group worked on a large scale map of the neighborhood, clarifying addresses and distances. Walks for exploration to nearby streets and buildings made this situation more concrete. In classroom shopwork pupils began to ask for wood by size and to use measurement more. There was a demand for rulers and yard-sticks. A kindergarten group needing wire mesh for a rabbit cage, got an elementary grasp of square measure when they had to buy some at 7¢ a square foot. With the help of square foot cardboard squares they worked out how much they needed and the total cost. But the storekeeper was so overwhelmed when the delegation arrived, he reduced the price to 5¢ and created a problem that was too complex for on-the-spot solution.

At this point one might ask, "What has all this to do with science?" A great deal. Quantitative comparisons are the heart of the experimental method. This method is an essential tool in many areas of science. As youngsters gained experience through functional number work, they carried their understanding into more typical science situations. A group growing bean seedlings made measurements of height regularly. From them were developed some interesting concepts of bean growth as compared with their own. They got figures on their own height at the start of the year from the health office records, then measured each other and figured out how much each had grown from September till April. A group of 7 year olds working with aquaria were able to grasp the relationship of the volume of water to surface in contact with air necessary to secure sufficient oxygen for their fish. Six year olds did a quantitative food study with rats. Seven year olds made and used simple graphs. Kindergarteners worked out for themselves a way to measure the length of their big chicken snake. To get its weight they weighed it in its cage and then weighed the cage without the snake.

In these and dozens of other ways, young children have been finding out direct means of getting information and checking facts. The results have been impressive and gratifying. It is perhaps worth repeating that all this was done on a very simple level—appropriate to, and functional with 5, 6, and 7 year olds.

The emphasis on functional number work with these children seemed to bring with it a valuable science concommittant: an increased awareness of things around them—usually in quantitative terms. In the dining room, playground, and even reports from home indicated more observations and very concrete questions about things. These, in turn, motivated further work in the classroom, as for example, the questions about how much milk was consumed by a kindergarten, led directly to evaluating milk as a food.

This increased functional use of quantitative measures by young children which were explored by some 15 teachers of primary grades, might, under other circumstances have been organized into a more formal research on methods of teaching arithmetic. However, the situation was more suited to an informal cooperative venture, which permitted each class teacher to participate to the extent that the idea appealed to her. Many entered wholeheartedly; some with reserve.

Teachers who have these children—one and two years later—report that they can recognize those who have had the richer experience and that their progress in more formal arithmetic has been markedly enhanced. We have only the informal estimates of teachers and some informal interviews with pupils to crudely evaluate our attempts. But if the opinions of pupils, teachers, and visiting parents are a guide, the activities seem headed in the right direction. As primary teachers become aware that young children can think and work quantitatively within the framework of their interests and abilities they can encourage such experiences for the cumulative effects these may have as their pupils move up through the grades.

Calling your attention to the 1949 revised edition of

ARITHMETIC
FOR YOUNG AMERICA

By John R. Clark and others. The series that systematically develops the number system for use in arithmetic reasoning...that helps children grow in power to help themselves.

World Book Company

YONKERS-ON-HUDSO · NEW YORK
2126 PRAIRIE AVENUE · CHICAGO 16

The Preparation Needed *by* Teachers *of* Arithmetic

By GERTRUDE CUSHING YORKE

Brooklyn College

ONE of the most vital educational problems to-day is the selection and preparation of prospective teachers. A candidate for the teaching profession should have superior intelligence and scholarship, an effective and inspiring personality, and the intention of making teaching a career.[1]

Prospective teachers need a broad and rich background provided by general courses, giving a survey of the most important fields of culture, which will enable them to become leaders in the community. From field work and seminar discussions they should gain reliable knowledge of social problems and proposed solutions. They must be inspired to attack such problems and participate in reasonable solutions.

The general professional courses needed by prospective teachers should include an orientation course in the field of education; laboratory courses in child guidance, the psychology of learning and of teaching, and testing; courses in mental hygiene, behavior problems,[2] and human relationships; and seminars which will integrate all the systematic courses studied simultaneously.

In addition to the above general professional courses prospective teachers of arithmetic need some specific work in the field of mathematics. The first of these courses should deal with what to teach,[3] based on the functional theory of education that the arithmetic taught and the processes stressed must be those most used in life. The fundamental purposes of arithmetic teaching are to give the child the skills required for making business decisions in terms of money, such as estimating, comparing, figuring, i.e. mastery of the four fundamental processes, simple fractions, percentage and interest,[4] plus informational problems; to begin and continue all arithmetic teaching on the child-level; to provide opportunities for optional recreational or free-activity work in the field of mathematics. The kinds of

1 Bagley, William C. and Thomas Alexander, *The Teacher of the Social Studies*, Charles Scribner's Sons, New York, 1937, p. 50.

2 Crow, Lester D. and Alice Crow, *Mental Hygiene in School and Home Life*, McGraw-Hill Book Company, Inc., New York, 1932, pp. 231-237.

Havighurst, Robert J. "Preparing Teachers to Meet the Problem of Delinquency," pp. 234-246; Healy, William and Augusta F. Bronner, "What Makes a Child Delinquent?" pp. 30-46; Fenton, Norman, "The Delinquent in the Classroom," pp. 48-65, *The Forty-Seventh Yearbook of the National Society for the Study of Education*, University of Chicago Press, Chicago, Illinois, 1948.

3 Wilson, Guy M., Mildred B. Stone, and Charles O. Dalrymple, *Teaching the New Arithmetic*, McGraw-Hill Book Company, Inc., New York, 1939, pp. 7-8.

4 90% of all adult figuring requires the use of addition, subtraction, multiplication, and division, while 5% requires the use of simple fractions, percentage, and interest.

arithmetic to be taught are[5] computational for drill-mastery, general informational, and problem and appreciation units. The grade placement of arithmetic topics in a functional curriculum[6] are addition and possibly subtraction covered completely as to facts and steps with perfect mastery in grade 3; multiplication covered completely and with prefect mastery in grade 4 with short division as the reverse of multiplication, if taught at all, and addition and subtraction checked and retaught as necessary; long division taught with complete coverage and perfect mastery in grade 5 with addition, subtraction, and multiplication tested and retaught as required; simple fractions (1/2, 1/4, 1/3 and in special situations 1/8, and 1/12) taught objectively and nonmanipulatively in grade 6 with the four fundamental processes reviewed and retaught according to pupil needs, as revealed by inventory tests; percentage and interest in grade 7 with the fundamentals thoroughly checked and retaught as needed; in grade 8 individual needs in the fundamentals tested and retaught. Thus in grades 1, 2, and 8 there is no drill. Throughout the whole arithmetic curriculum are meaningful problem units and appreciation units.[7] There is much incidental learning and teaching, such as: counting, reading numbers including Roman (on clocks and as chapter headings in books), most of the fractions required in actual usage, all that is needed in the manipulation of decimals (from United States money), measures as used, and vocabulary.

The second specific professional course needed by prospective teachers of arithmetic should deal with methods,[8] techniques, and materials. Student teachers should learn that first of all each child must be checked to discover what arithmetic he as an individual needs to be taught, and then teach according, the goal being perfect mastery of the drill material. The whole group should be given the initial teaching of a drill process, but should soon be divided into five, six, or even more groups, with some children working alone. In this way the teacher is free to help and check all the groups, and can observe how each child thinks and works. Group work should be undertaken also on large motivated written problem units which are related to business, and so further motivate the drill. A few inspirational units in the informational and appreciation phases of arithmetic should be developed. The materials essential for the drill work are inventory and diagnostic tests;[9] fact cards used individually, a set made by each child of all the combinations in the four basic processes; and drill service books.[10]

When the initial teaching of arithmetic is of a high quality there will be little need for the so-called remedial[11] or reteaching. Unfortunately, however, there will always be some children who have had to be absent or who have not had good initial

5 *Ibid.*, pp. 15-31.
6 *Ibid.*, pp. 36, 101-129, 131-149, 150-163, 165-179, 194-211.
7 *Ibid.*, pp. 309-317 and 343-365.
8 *Ibid.*, pp. 413-414.
9 *Ibid.*, pp. 280-293.
10 Wilson, Guy M., *Manual and My Addition Drill Book; My Subtraction Drill Book; My Multiplication and Short Division Drill Book; My Long Division Drill Book*, The Macmillan Company, New York, 1933.
11 Wilson, Stone, and Dalrymple, *op. cit.*, pp. 395-400.

teaching, and so will need this kind of help. The methods, techniques, and materials mentioned above are the same, except more individualized. For the immediate present remedial groups are still a "must," and student teachers need practice-teaching both with such a group and with individuals. Super-motivation; a shorter daily assignment which every child can do accurately and with ease in a given time so that his confidence is gradually built up; and the independent use of the drill book after the child knows the processes, steps, how to check, and can work accurately are some of the requirements for successful remedial arithmetic teaching.

Besides the professional courses previously mentioned prospective teachers of arithmetic should extend their knowledge of the field of mathematics by taking advanced courses such as calculus, trigonometry, statistics, thus going a long distance into higher mathematics.

The experience needed by prospective teachers of arithmetic should include ample opportunity for the observation of master teachers in this field; demonstration of the best classroom procedures, methods, and techniques by arithmetic experts; some simple research and experimentation; and practice-teaching adequately supervised in accordance with the principles of mental hygiene. Also student teachers looking forward to working in the community-centered schools of tomorrow further need the broadening experience of some form of community service. They may thus get first-hand observation, and be stimulated to do relationship thinking in regard to underprivileged community patterns in housing, traffic, tensions in family life and racial minority groups,[12] and other socio-economic and intercultural problems. School camping is another experience in democratic living with children which should be a part of every student teacher's preparation. Furthermore every urban student teacher should work for at least one summer in a rural community, participating in its social life and studying its problems, while every rural student teacher should spend some time working in a city community, learning about the social problems, welfare, and progress of such a community. Prospective teachers of arithmetic in particular should get a considerable amount of experience in business or industry, making a study of the actual arithmetic used. And finally student teachers should be given the opportunity to study and travel abroad so that they may attain a world outlook which will help them as leaders in cooperative laboratory classrooms more effectively to guide their pupils in the great adventure of democratic community living.

A teacher so trained should be an inspiration to children, as well as a superior prospect for teaching arithmetic. He will find in arithmetic a good medium for carrying the higher values of child and community service.

12 Van Waters, Miriam, "Special Community Programs to Prevent Delinquency," The Forty-Seventh Yearbook, *op. cit.*, pp. 214-226.

The Place *of* Drill *in* Learning Theory

By B. R. BUCKINGHAM
Boston, Massachusetts

WHEN I refer to learning in this paper, I have especially in mind the learning which children do when they are attending elementary school. I am chiefly concerned with the learning of arithmetic; that is, with specific interrelated learnings, the common goal of which is competence in arithmetic. Obviously, therefore, I refer to *human* learning.

Although current theories of learning are to a large extent based upon animal learning, I shall have as little as possible to say about animal learning. Indeed, I am not interested in it as such. Only as it throws direct and unmistakable light upon human learning does it have significance for teachers and learners in our schools.

In spite of some similarities, animal learning and human learning seem to me to be too different to permit detailed inferences to be drawn from the one and applied to the other. It is not necessary to deny evolution. But it ought to be said, and said with no uncertainty, that in the ability to organize experience, to foresee outcomes, to make generalizations, to do long-range planning, to execute research, to make and transmit records, and to profit vicariously from the experience of others—that in these abilities man is raised so far above rats and dogs and apes as to make his learning not merely quantitatively but qualitatively different.

I believe, therefore, that we are justified in a healthy skepticism as to the validity for human purposes and especially for classroom purposes of elaborate systems of learning based upon the behavior of sub-human organisms, at least until the conclusions of comparative psychology have been confirmed by research involving the higher types of learning with human beings.

In what follows, I shall therefore be obliged at some points to extrapolate. In other words, I shall in some cases go beyond the record—this because the psychologist may have failed to include data on human learning.

Drill I conceive to be essentially repetitive of any element entering into a learning situation. Another name for drill is practice; still another is recurrent experience. Our problem, then, is to reveal the effect which, according to typical psychological theories, this repetitive element has upon the amount of learning. Amount of learning may be measured by the accuracy or facility of the product, by its retention or resistance to forgetting, and by its transfer value to situations related to, but not identical with, the learning situation.

Connectionism

It was at the turn of the century during a period of profound skepticism as to the efficacy of training that Thorndike began to evolve his theories of connectionism. He never became an avowed behaviorist. Yet his theory had unmistakable aspects of behaviorism. In those days, Thorndike made much of his so-called law of exercise, a law in virtue of which, according to him, connections between stimulus and response were strengthened with practice and weakened with disuse. So matters stood until about 1930 when Thorndike, by his own researches, proved that mere repetition did not strengthen connections and did not therefore influence learning. Something more was necessary—reward, a consciousness of progress, a feeling of familiarity, a sense of value. The net result of this was that drill which was sheer repetition was proved to be of little value, but that these other things —things which could not be had without repetition—were exceedingly fruitful. Practice, then, is properly a part of learning, because it permits rewards and other concomitants of practice to play their part.

Thorndike's psychology before it was subjected to the criticism of others as well as of himself was responsible for much unenlightened drill. Perhaps "responsible" isn't the word. The schools had long been committed to an unintelligent, repetitive program. What the early writings of Thorndike seemed to do was to justify all this. It is not, therefore, surprising that the Gestaltists began by specifically directing an attack upon Thorndike's connectionism.

Meanwhile, however, the behavoirists came upon the scene. I well remember a course which I took back in 1912 with Watson. It was a singular experience. According to Watson, the behavior of human beings was not only unintellectual, but stupid, being merely the resultant of a push here and a prod there. Consciousness was ruled out, and intelligence seemed to be missing. I remember that even Dr. Watson had some difficulty in accounting for rational thinking. It was not until Pavlov's conditioned reflex came to his attention that he felt himself really justified in a strictly behaviorist interpretation of reasoning.

Behaviorism According to Guthrie

The crude behaviorism of Watson is no more. He had, however, considerable influence upon several of the system-makers such as Guthrie, Hull, and Skinner, men whose contributions to learning theory are highly regarded by psychologists. Guthrie took over one aspect of Thorndike's system, namely, the associative shift. To Thorndike, associative shift was a subordinate matter. According to this doctrine, an organism having learned a response to a given stimulus may learn to make the same response to a related stimulus. Guthrie made associative shift the cornerstone of his system, and his basic law of relationship —the relationship which determined the ease with which the response in question could be elicited by the new stimulus—was the relationship of contiguity or togetherness. If a child manipulating blocks discovers that three blocks and two blocks are five blocks, he may associate the response "five" with the stimulus, not of blocks, but of semi-concrete objects such as circles, crosses, or straight lines. Thus

he has shifted his response from the concrete stimulus to the associated semi-concrete stimulus. A further shift is effected when he responds with the word or the idea of five to the abstract numerical symbols, 2 and 3.

Guthrie holds the peculiar view—remember this is derived from experiments upon animals—that the organism learns and learns completely the first time it carries out the required act successfully. A cue sets off a series of movements culminating in the appropriate response. If the organism stops at that point and there is no subsequent interference, forgetting will not take place. How, then, in view of undeniable improvement with practice, does Guthrie account for the effects of practice? If all the learning takes place at the first presentation, what room is there for practice?

Here Guthrie eludes us by denying his interest in outcomes and affirming his interest in movements. The former—that is, the outcomes—are in reality a whole group of movement responses leading to success. Skill in skating, in playing billiards, or in multiplying three-place numbers is in each case a bundle of habits. It is these complex products rather than the simple elements of which they are composed which, according to Guthrie, are improved by practice. Since in human learning at school we are interested in outcomes—we insist upon skill in adding a column of figures—we shall have to score Guthrie as in favor of drill for the purpose we have in mind. Doing a long-division example involves many movements and elements, and each, according to Guthrie, is fully learned in a single repetition; but the whole series must be practiced as a series in order to insure success in the total undertaking.

As for insight, Guthrie has little confidence in it. He recognizes that learning with foresight of its outcome may take place; but aside from that, insight is, in his view, sheer luck and is not therefore to be taken into account in a scientific system.

Behaviorism According to Hull

I have mentioned Hull as one of the behaviorist group. He has carefully built up a systematic theory of learning; in fact, his theory is more systematic than that of any of his contemporaries. He announces certain postulates (which, of course, being postulates do not require proof) and upon these basic assumptions he erects a structure similar to the structure of certain branches of mathematics. His theory is difficult to understand. It is top-heavy with a strange terminology and a maze of symbols. Luckily, we need not go into these things. Our interest is in Hull's attitude toward drill and related adjuncts of learning.

Mere repetition—that is, barren drill—does nothing, according to Hull's system, except interfere with learning. Here Hull is in complete agreement with Thorndike's later experiments with human subjects. Hull explains (if it is an explanation) improvement as due to reinforcement. This is a technical term, well known in the vocabulary of behaviorism. Reinforcement is brought about, according to Hull, by a diminution of the organism's sense of need. This is called "need-reduction." In Hull's standard illustration of the six-year-old girl who was caused to look for candy under a book on a library shelf, satisfaction (or need-reduction) with

its concomitant reinforcement first came about only after many books had been lifted. Successive repetitions of this reinforcement reduced the amount of wasted effort until the location of the candy was learned and the child went directly to the right book.

Thus it appears that practice is still with us in Hull's scheme as it was in Guthrie's and in Thorndike's. Now, however, it appears under new names, such as reinforcement and need-reduction. Moreover, in complex skills the role of practice or drill is unquestioned.

As for insight—and this is one of the big ideas that we want to keep our minds on in talking about practice—Hull shows the usual behaviorist's avoidance of subjective ideas. He seems to think that the organism's response to stimuli are substitutes for ideas. Response follows stimulus and becomes itself a stimulus with a consequent response, and so on in a sort of chain reaction. Somehow this succession of events is supposed to give to ideas a substantive quality. The idea of these successive responses leading up to the final one as in anticipation of the final response is as close as the typical behaviorist can come to the concept of insight.

Descriptive Behaviorism (Skinner)

Skinner represents another phase of behaviorism. His system has been called descriptive, just as Hull's has been called mathematical. While all the behaviorists have predilection for animal psychology, Skinner so far has made only casual references to human behavior. He promises a book on verbal behavior, but from what he has already written it seems likely that he will apply to the verbal behavior of human beings the same quantitative theory that he has already developed in his book on experiments with rats.

I shall, therefore, pass over Skinner's theory, interesting though it is, with the simple observation that he recognizes the role of reptition in strengthening or—to use the more acceptable term—reinforcing behavior. He regards the problem of understanding as essentially irrelevant within the framework of his system. For forgetting he offers no special theory.

Functionalism

In the classification of psychological theories there are two main subdivisions. There are associative theories and field theories. Connectionism and behaviorism, the former represented for our purpose by Thorndike and the latter by Guthrie, Hull, and Skinner, have a common underlying logic which permits them to be grouped as association theories. We now come to another type of association which has been called functionalism. Some of its representatives in American psychology are Angell, Carr, Robinson, McGeoch, and Woodworth. These men differ among themselves, and the fact is that functionalism is not a straight-line theory which you can assign to one man. It mediates between connectionism and gestalt. Although it existed for many years alongside of behaviorism, it never capitulated to behaviorism. Its experimental basis does not rest wholly or even chiefly upon animal learning. It is thus more humanistic in outlook than the theories to which we have just been giving attention.

Nevertheless, functionalism properly belongs in the associationist camp. It recognizes laws of associative for-

mation, that is, of learning; laws of associative revival, that is, recall or recognition; and principles of contiguity, frequency, and vividness. It recognizes without evasion the place of practice in the act of learning. It asserts the law of frequency, but it makes an important qualification. It insists upon relative frequency and thereby recognizes losses when practice is unduly prolonged. It emphasizes the advantages of spacing in drill.

Motivation is of the highest importance, especially in Woodworth's formulation.

The Functionalists, in dealing with the question of understanding, fall far short of the concept of insight as maintained by the Gestaltists. Meaningful, material, it is admitted, is more readily learned than nonsense material, but meaning is not held to serve beyond the role assigned to it in ordinary associative learning.

Gestalt Theory

The activity of the Gestaltists had little effect upon American psychology until the middle twenties when two books, one by Koffka and the other by Köhler, were translated into English. Even then the impact of the Gestalt theories was not really important until some of the most prominent of the Gestaltists, exiled from Germany, came to this country and taught the new doctrine from our own seats of learning.

It was against the background of behaviorism and of trial-and-error learning that the new doctrine of the Gestaltists made its appearance, and it was against behaviorism and trial-and-error learning that it leveled its most damaging criticism. I am not here interested in the details which make up Gestalt theory, nor in the variations within the theory which have been expounded by different members of this school of thought. Those who study Gestalt psychology —and today everyone who is interested in learning must do so—will encounter a new terminology and a new set of laws. They will have to break new ground and capture the ideas of field, of structure, of closure, of good continuation, and of many others. To me, however, the common sense of Gestalt is quite as evident as its break with conventional association.

For example, the roles assigned to background or past experience and to understanding or insight are, at least in their educational import, the most fruitful of all the ideas offered in the twenties of this century as a challenge to behaviorism and trial-and-error learning.

Indeed, it now seems strange that the idea and the place of learning with insight should have waited so long for its appearance in psychological theory. In this we have a remarkable resort to common beliefs, for in my judgment, something very like the Gestaltist's notion of insight has always been in the minds of plain people. To see a thing, to get the idea of it, to understand it, has always, it seems to me, been held to be pretty much synonymous with learning it.

As for background, that is, for related experience in its bearing upon learning, while "plain people" have probably thought little about it, school people have long been committed to it. Herbartianism was based upon it, and some of the tenets of Herbartianism —preparation, for example, now called *readiness*—have never complete-

ly lost their hold upon the practice of the American teacher.

These great ideas—the ideas of relevant experience and of insight—were also eagerly welcomed by the liberals in education, the followers, not of Herbart or even of Thorndike, but of Dewey. They fitted well into Dewey's doctrine of rational thinking, a doctrine in accordance with which we are expected to behave like human beings rather than like rats in a maze, and in which we are permitted to learn by purposeful and intelligent processes.

Classical Gestalt theory, the theory of Wertheimer, Koffka, and Köhler, assigns to past experience a *trace*. This trace is not in any sense physical. It may or may not involve neural changes. That aspect of the question is one of compete indifference to the Gestaltists. It does insist, however, upon an effect of experience, and this effect it calls a trace. It is this doctrine which points to and insists upon the usefulness of repetition. The reasoning is simple. If the trace left by the related experience of the past is important, then the frequency of related experience is obviously advantageous in learning because of the firmness and effectiveness of the trace thereby produced. A law of frequency is as much an essential in Gestalt theory as the concept of insight.

It is not just any drill, however, which will be effective. The trace based upon past experience can only have its maximum effect when the past experience is not only related to the present situation but is *recognized* by the learner as so related. Drill, therefore, should be with understanding.

Again, practice is regarded as "furnishing conditions favorable to a closer articulation and consequent fixation of whatever would otherwise be loose and inarticulate in form." Frequency of repetition is helpful, but its helpfulness is greatly enhanced when the activity which is thus rehearsed favors its articulation into a whole. This would seem to dispose, at least from the point of view of the Gestaltists, of the usual types of drill in arithmetic—drill in which a whole is analyzed into minute parts and each of these practiced separately, with the thought that the learner will put them together subsequently into their original whole.

The doctrine I am now alluding to would require elements of wholeness in the recurring activities.

I have referred to the classical Gestaltists, and I shall have little to say about the various divergencies which have more recently taken place in what might be called the neo-gestalt theory. I refer to the views of Lewin, of Tollman, and of Wheeler. Lewin is not much interested in the problems of learning. Tollman seems to be trying to reconcile behaviorism and Gestalt theory. Wheeler has attempted vigorously to create an educational psychology along Gestalt lines. He denies the concept of trace, but under the heading of *pacing* he brings in the idea of practice. Indeed, Wheeler's idea of pacing is extremely suggestive as to one aspect of good practice, namely, its progressive character.

What Then Is the Place of Drill?

The current theories of learning have been formulated by connectionists, behaviorists, functionalists, and Gestaltists. These theories express different attitudes toward drill. In

general, the theories based mainly upon animal learning have made the least provision for drill in human learning.

Connectionism emphasizes drill. Its strengthening role is frankly acknowledged. It must not, however, be sheer repetition like the thousand attempts of a blindfolded subject to draw a four-inch line. Drill must have content. It must be distributed. Indeed, the efficacy of drill lies not in repetition, but in those things which repetition alone makes possible.

The behaviorists vary among themselves in the importance which they attach to drill. Guthrie, with his peculiar doctrine that full learning takes place upon the first successful trial nevertheless finds room for practice by asserting that he is referring to movement responses as completely learned at first occurrence, while outcomes (which consist of large groups of movement responses) are freely admitted to require the facilitation of drill.

Hull emphasizes the fact, already referred to, that sheer repetition is barren of results in learning. However, Hull does not leave drill completely out of his thinking. Improvement in learning is due to reinforcement, and reinforcement is strengthened by recurrent experience. Skinner, like Hull, finds a place for repetition in the reinforcing of behavior.

All these men, whether connectionists or behaviorists, have completely failed to give insight an important place in their theories of learning. The functionalists, while in this respect they fall far short of the Gestaltists, make much of the importance of meaningful learning, and since this can only mean material meaningful to the learner, we have preliminary recognition of the concept of insight.

In this, as in other ways, the functionalists mediate between connectionism and Gestalt without too much reference to the ideas of the behaviorists. For example, like the connectionists, they squarely recognize the place of practice in the act of learning. Finally the Gestaltists, enthusiastically supporting the doctrine of insight, have nevertheless found worthy place for drill in their system, provided the drill be meaningful. It is widely held as an item of Gestalt-theory that drill should follow understanding.

Those of us, therefore, who have found in practical classroom procedure the latent wisdom of the dictum 'practice makes perfect' need not renounce our faith, nor, upon any valid application of current learning theory, regard ourselves as reactionary.

Metric, *A* Post-War Aid?

By G. HAROLD BILLINGHAM
Ocean Park, Maine
Designer - Engineer,

CONGRESS legalized the metric system in 1886, and it is the standard of Hawaii, the Philippines, and Puerto Rico. As recent as 1926, the issue to make metric our standard was revived in Congress. Now, with reconversion and its retooling processes important factors, the change could be made to advantage; by both providing jobs and a time saving practical educational program to the American people.

Sales mean production, production means wages, and wages-buying power, a prosperous cycle.

Working round-the-clock has placed the equivalent of years of normal use on our equipment, and much of it in addition will be obsolete. Machinery now in use in many cases has ceased to be efficient, and where the process is to be continued or revised, the new machines could just as easily be built to be operated on the metric system. Units worth salvaging could be redialed with metric engineered lead crews; and made more attractive by the use of newer materials and dis-use of so-called "war finish." Industrial uses of color also aid in lessening operator fatigue, maintenance of production schedules, and human relations.

Many small tools also have reached the peak of their built-in precision and will need replacement. The cost of this group will largely be assumed by the mechanic. Well known tool manufacturers have had metric divisioned units listed in their catalogues for years, and with cut backs on war products could expand their "metric" anticipated production.

A mechanic who can handle a micrometer certainly can learn to read his "metric" mike in a few hours, and also take a revised combination square and scale in stride. Inspection gages are stamped in decimals for accurate readings, so readjustment in the precision field could be taken in stride. Quality control is now an accepted procedure for standard products.

Housewives were readily converted to the idea of purchasing oranges, pineapples, potatoes, and bananas by the pound. Some baby foods are sold by metric measure, and infants drink from metric graduated bottles in many cases. Mathematical experience gained in figuring ration points would be more than ample for lessons in metric.

We use the metric decimal system in our monetary system, an excellent background for beginners. Everything is in units of 10, eliminating fractions.

Gasoline, from service pumps, is sold by gallons and tenths, small spark plugs are 10 m.m.; 6.50 x 16 is a tire size, and .025 is a common ignition point gap. Auto services are doing their share for metric advocates.

Sales of rules to school children, metric sticks (replacing yard sticks), and novelty tape measures to housewives would be an important item, to designers, producers, and merchandizers, in the change-over to metric units. Fractions, by the way are often

a child's first stumbling block in our educational organization.

Our auto speeds, judged by newly designed metric measuring devices would be in kilometers per hour, our liquids sold by the liter (which approximates our quart), and our solids weighed by the half kilogram replacing our pound. Road signs, railway mile posts, and a few other more or less permanent pieces of equipment, would be affected, but community changes and weathering make periodic painting or replacement a necessity, except in war time.

Service men and women with foreign service credits would be valuable assets to a metric conscious community. They had practical experience in areas where metric was an established factor in daily routine.

Doctors write prescriptions in metric, vitamins are sold by metric weight, radios use meter waves, and some hospitals weigh babies in grams. H. S. Vanderbilt's VIM, a twelve meter boat, won the international challenge cup.

Pharmaceutical houses, jewelers, optical goods producers, chemical plants, and some manufacturers already use the metric system. Others have expressed approval of it, because of "paper" savings. Think of all the man-hours devoted each day to a change over to decimals! Here are a few of the conversion factors for engineering quantities:

Given	*Required Unit*	*Factor*
Inches	Centimeters	2.54
Centimeters	Inches	0.3937
Cubic feet	cu. meters	0.0283
Feet	Meters	0.305
Meters	Feet	3.281
Meters	Inches	39.37

In our standard we convert from one unit to another by multiplying or dividing. For example:—143 inches equals 11-11/12 feet, or 3-35/36 yards.

Those using the metric system, without considering motion economy, would move the decimal point twice for a comparable problem! 143 centimeters, 14.3 decimeters, 1.43 meters.

Our Army uses inches for coast artillery, millimeters for field guns, calibers for rifles and machine guns, and gages for shot guns. One standard would eliminate many details that have been accepted practice.

Thousands of rejected 50 mm. ammunition containers have been sold for use as security and fishing tackle boxes. This is an example of public purchase without regard for the measuring standard used in the figuring of cubic content of the product.

The foot, originally meant the length of anyone's foot; the inch was three barley-corns. The yard, the distance from nose to tip of right thumb. The rod was the sum of the length of left feet of 16 church goers.

Some ancient people had a "down hill" and an "up hill" mile. It, of course, was harder to climb the hill—thus the logic for the two standards.

French scientists decided about the time of the French Revolution to standardize, using decimals, and have a minimum number of units. The meter evolved—one ten millionth of the distance between the North Pole and the Equator. The gram, basic measure of weight, was devised from the weight of one cubic centimeter of pure water. One thousand cubic centimeters became the liter, completing the three basic units:—liter, gram, meter.

Designers, engineers and mechanics of all types are needed in world rebuilding processes. From past experiences they will have no difficulty in using the speedy, accurate metric system.

We have a potential market for all kinds of goods abroad, but capital is lacking. If we follow the pattern set after the last war and finance the foreign market there will be the greatest peace time activity in history. Sugar, leather, fiber, jute and rubber, will be among our import needs for several years. Metric standards can help speed their progress to their varied general uses.

Progressive education programs will find means to assume their share of the conversion from our system to Metric when it is finally adopted.

Metric may be one of the tonics necessary to avoid another depression.

BOOKS *for* YOUNGER READERS

Reviewed by GERST

The Dolls' House. By Rumer Godden. Ill. by Dana Saintsburg. Viking Press, New York, 1948, 125 pp., $2.50.

Tottie, a hundred year old Dutch doll winds her way through an unusual and enchanting story of an almost real doll family. The dolls' story, told with a sincere appreciation of human greatness and frailty, is an absorbing account of family or group living. For girls, especially those who like dolls, ages 6 to 9.

Saltwater Summer. By Roderick L. Gaig-Brown, Morrow, 1948, 256 pp., $2.50.

Salmon fishing off the coast of British Columbia is the background of this novel of a young man and his struggle to pay debts and retain his youthful but strong sense of integrity. The book is rich in dialogue and action and written with a great liking for young people and good salt air. Boyes ages 10 to 14.

The Far Distant Bugle. By Loring MacKaye. Decorations by Avery Johnson. Longmans Green, New York, 1948, 264 pp., $2.50.

Joe, a boy of the western plains, and Dick, son of an army officer, meet and after many fearful adventures become fast friends in spite of their initial dislike for one another. The book, set in a western army outpost at the outbreak of the Civil War, is not only good historical fiction but exciting reading as well. Ages 12 to 14.

Here Suzy! By Verna Hills. Ill. by Marion Downer. Lothrop, Lee & Shepard, New York, 1948, 123 pp., $2.00.

The arrival of Suzy, a red hen, gives rise to a month of adventures for Joey and Amos that includes a traveling show and a trip to the zoo. With each chapter almost a complete story, clear direct sentences and many black and white pictures the book will capture and hold the interest of young novel readers. Ages 7 to 9.

Yellow Fairy Book. By Andrew Lang. Ill. by Janice Holland. Longmans Green, New York, 1948, 329 pp., $2.00.

Blue Fairy Book. By Andrew Lang. Ill. by Ben Kutcher. Longmans Green, New York, 1948, 372 pp., $2.00.

Green Fairy Book. By Andrew Lang. Ill. by Dorothy Lake Gregory, Longmans Green, New York, 1948, 355 pp., $2.00.

Fairy tale fans, old and young, will be delighted with Longmans Green's three handsome editions of the Lang tales. The charm and grace of Lang's art of retelling old stories has been further enhanced by the three artists black and white and color pictures.

EDITORIAL

UNESCO *and* Educational Vagueness

By CARL G. MILLER

ACCUSED of vagueness in its aims and hard put to place a finger on solid accomplishments to date, UNESCO met not long ago in Beirut and made one move that should get approval from the practical-minded. It refused to re-elect Julian Huxley, British biologist, as director general. Guided by the U. S. delegation, it chose Jaime Torrest Bodet, Mexico's foreign minister, for managing the association in more practical directions. All one needs to do is to glance at the photographs of the two men to be fairly certain that the delegates were wise in their choice. The Huxleys (Julian and Aldous) are smart in their way, but their way is not easily comprehensable, and is doubtfully appreciated, by many hard-headed Americans.

Now what is true of UNESCO is, alas, too often true of educators far and wide. Where they should be definite, they are often vague. Where their objectives should stand out like mountain peaks in their size and visibility and receive public admiration, they are often enshroulded in fog. Where educators are idealistic, they often need to be more practical. Where they are liberal in their willingness to accept new theories, they would educate young Americans better if they were more conservative. Where they are super-susceptible to what appears to be a slight infringement of their freedoms, they lost a little in public confidence.

Just as we should be reluctant to pay UNESCO's bills unless we can see value received for our money, just so should American taxpayers react to bills for general education. Not that educators alone could do better. The public certainly can do better in accepting more rigid standards that would jolt the lackadaisical into line. What many school systems would appreciate, for instance, is more parents who, instead of demanding a passing grade for their son, would say: "Yes, Bill, ought to take the work over again. He simply hasn't learned the fundamentals."

BOOK REVIEWS

Mining Camps: A Study in American Frontier Government. By Charles Howard Shinn. Introduction by Joseph Henry Jackson. New York. Alfred A. Knopf. 1948. xxvi and 291 pages. Index. $4.00.

Mining Camps was first published in 1885, not too many years after the heyday of the California gold rush and the mining booms of the mountain states. The book has long been one of the most sought-after and most difficult to procure volumes about early California. Now the book has been reprinted and added to the series "Western Americana." The book presents a vivid account of the development of law and order and of government in the typical mining communities of the west. In order to give as complete a picture as possible, Shinn studied the mining communities of pre-historic days and of the medieval eras. The work remains a classic for it is an original contribution to our knowledge of ourselves and our method of self-government. — WILLIAM P. SEARS.

The Burns Mantle Best Plays of 1947-1948. Edited by John Chapman. New York. Dodd, Mead and Company. 1948. viii and 494 pages. $4.00.

The Burns Mantle Best Plays series has been a standard reference volume since the season 1919-1920. Every school library that is worthy of its name has the entire series on its shelves. The current volume, for 1947-1948, is unique in that John Chapman, dramatic critic of the New York *Daily News*, becomes editor, filling the place left vacant by the death of Mr. Mantle. Like all the other volumes in this series, the present volume is not only a statistical record, an anthology of the year's best plays, but a most interesting treasure of theatrical history. — WILLIAM P. SEARS, New York University.

Paul Verlaine: Selected Poems. Translated by C. F. MacIntyre. Berkeley and Los Angeles. University of California Press. 1948. XX and 228 pages. $3.75.

The place of Verlaine in the realm of French letters is an assured one. At the poet's burial, the humanitarian Coppee said, "Verlaine has created a poetry that is indeed his alone, the poetry of an inspiration at once childlike and subtle.—Such poems are made to last." Mr. MacIntyre has translated and annotated Verlaine's best poems and has selected these from the poet's first six volumes. The translations faithfully reproduce the nuances and delicate vibrations of Verlaine's verses. The translator's brief preface sketches Verlaine's life in relation to his poetry. The original poems are printed face to face with the English translations in this sound and scholarly contribution to letters. — WILLIAM P. SEARS, New York University.

The Tennessee. The New River: Civil War to TVA. By Donald Davidson. Illustrated by Theresa Sherrer Davidson. New York. Rinehart and Company. 1948. viii and 377 pages. $3.50.

Some time ago, the story of the "old" Tennessee river was published in the very informative "Rivers of America" series. Now Mr. Davidson continues the dramatic and exciting tale of this river. The present volume contains the grim saga of the Civil War in the Tennessee Valley and the river's part in the campaigns of Grant and Sherman. Despite the ravages of the war and the dreadful days of the Reconstruction era, the Tennessee rose to a new day of industrial development with the final conquering of Muscle Shoals. The account of the tremendous TVA program brings to a conclusion this story of a most interesting and important river.

— WILLIAM P. SEARS

Interpretations of Modern Legal Philosophies: Essays in Honor of Roscoe Pound. Edited and with an introduction by Paul Sayre. New York: Oxford University Press. 1947. $12.50.

This important and significant book is a collection of essays on significant modern legal philosophies, written by the world's most influential legal philosophers for presentation in this volume to Roscoe Pound on the seventy-fifth anniversary of his birth. It is perhaps the most comprehensive treatment which modern legal theory has received, including as it does thirty-eight critical or expository essays dealing with almost every significant phase of modern legal thought. The book is as authoritative as it is comprehensive, for each essay is written by the originator or principal exponent of the particular modern interpretation of law with which it deals.

It is fitting that this volume was presented by its distinguished editor and contributors to Dean Pound, who is universally acknowledged as the most influential modern American legal theorist. His theory of social interests has taken its place with the contributions of the Utilitarians and the Institutionalists as one of the fundamentally important explanations of law as a means of social control. Indeed, the theory of social interests has made a law as vital a subject for the economic theorist as it always has been for the political theorist.

Law is, of course, the basic instrument of formal social control. Economic and political theorizing is of no real significance until given legal recognition and application. This relationship between economics, government and the law is so intimate that it often has been misunderstood, with the result that the law has to some extent mistakenly been treated as an authoritative source of the *summum bonum* in political economy, as well as a useful means of its achievement. This is of course error: law is a means, not an end.

Indeed law is the indispensable means to the ends of social policy, and some of these ends, such as an effective, democratic world government and a rational world economy, are becoming so vitally compelling that it may well be doubted whether Western civilization can survive its failure to achieve them in the immediate future. And underlying law as a means to socially desired ends is the philosophy upon which the law itself is based. That is why comprehension of the ideas with which this book deals is fundamental to an understanding of the process of translating social, political, and economic values into realized ends.

Yet where the means for the achievement of ends are lacking, the means themselves become ends. Thus is explained the vital importance of legal theory in the immediate postwar world. The two basic postwar problems are world government and world economic order. Neither is possible without the other, and neither can be achieved except through world law. As yet there is very little that can be called world law, as the pitiful impotence of the UN clearly demonstrates. But ideas must precede institutions, and this book at least demonstrates that some very worthwhile ideas are on their way to being formulated.

Certainly there is no doubt that Mr. Sayre has brought together a collection of ideas of the greatest economic and political significance, and which can make a very valuable contribution to that great vacuum of social organization, the field of international affairs. To summarize them would require a volume. The most that can be said here is that the book is an outstanding contribution to social science and a compilation of vitally significant prolegomena to the economic and political theory which will be applied to the compellingly important practical problems of international affairs. It is heavy but richly rewarding reading. — C. W. GILLAM, Carleton College.

THE GRACE M. ABBOTT TEACHERS' AGENCY

GRACE M. ABBOTT, MANAGER

120 BOYLSTON STREET, BOSTON 16, MASS.

MEMBER NATIONAL ASSOCIATION TEACHERS' AGENCIES

Schermerhorn Teachers' Agency

Established 1855 — *CHARLES W. MULFORD, Prop.*

366 FIFTH AVENUE, NEW YORK CITY — BETWEEN 34th AND 35th STREETS

BRANCH OFFICE: 1836 EUCLID AVENUE, CLEVELAND, OHIO

MEMBER NATIONAL ASSOCIATION OF TEACHERS' AGENCIES

A superior agency for superior people. We register only reliable candidates. Services free to school officials.

Great American Teachers Agency

TEACHERS NEEDED—ALL KINDS. Splendid opportunities are presenting themselves and you should take advantage of them. With our experience we can give you the guidance needed so you can make the most of these opportunities. Write to us immediately.

Est. 1880 Successor to THE PENN EDUCATIONAL BUREAU 65th Year

205 NORTH SEVENTH ST. — ALLENTOWN, PENNA.

Member of National Association of Teachers' Agencies

NEW ENGLAND STATES TEACHERS' AGENCY

120 BOYLSTON STREET — BOSTON, MASSACHUSETTS

Telephone Hubbard 2-0549

VIDA S. CLOUGH, A. B., M. Ed., Director

MYRA L. HERRICK, A. B., M. A., Placement Director

Discriminating service for administrators. Exceptional openings for qualified teachers desiring opportunities in public schools, independent schools and colleges.

"An Agency Organized by Educators to Serve Educators"

COLLEGE TEACHERS AND SCHOOL EXECUTIVES

We Need You For The Better Paying Positions.

For a Better Salary and a More Desirable Position Enroll with the R.M.T.A.

FREE ENROLLMENT. — UNEXCELLED SERVICE.

ESTABLISHED 1906

ROCKY MT. TEACHERS' AGENCY

410 U. S. NATL. BANK BLDG. — WILLIAM RUFFER, Ph. D., Mgr. — DENVER, COLO.

MEMBER N.A.T.A.

LARGEST, MOST WIDELY PATRONIZED TEACHERS' AGENCY IN THE WEST

How many of these 20 basic skills have your pupils mastered?

- ☐ How to Use Parliamentary Procedure
- ☐ How to Understand Social-Studies Reading
- ☐ How to Use an Encyclopedia
- ☐ How to Make an Honest Report
- ☐ How to Use a Dictionary
- ☐ How to Use a Map
- ☐ How to Use an Atlas
- ☐ How to Do Committee Work
- ☐ How to Take Part in a Social-Studies Discussion
- ☐ How to Use the Library Card Catalog
- ☐ How to Use an Index
- ☐ How to Use the *World Almanac*
- ☐ How to Locate References on a Topic
- ☐ How to Read a Graph
- ☐ How to Read Percentages, Estimates, and Figures
- ☐ How to Read Pictorial Graphs and Maps
- ☐ How to Outline Social-Studies Material
- ☐ How to Prepare a Good Report
- ☐ How to Give an Oral Report
- ☐ How to Make a Written Report

Then order for 30-day free examination:

SOCIAL-STUDIES SKILLS

with Individual Self-Testing Key

By FORREST E. LONG *and* HELEN HALTER

SOCIAL-STUDIES SKILLS is the new textbook for pupils that allows teachers to make more efficient use of their time in bringing pupils quickly to a point of competence in the 20 basic social-studies skills.

This humorously illustrated book makes it fun for pupils to learn the skills that will improve their daily social-studies work. Busy teachers are relieved of an endless mass of detailed preparation and instruction. Pupils can even work along on their own, checking one another's work with the *Individual Self-Testing Key*. There are directions, practice materials, tests, and retests on each of the 20 skills.

Use SOCIAL-STUDIES SKILLS, and your school will have a new talking point in the community. You can say with pride that in one class alone your pupils are being taught 20 practical skills that will be useful to them throughout life. You can say it at P.-T.A. meetings, before service clubs, and wherever criticism of the schools arises. The cost? A classroom set of 30 books, which can be used by a different class each hour, is only $31.50!

Order a copy for each of the social-studies teachers today. They can make good use of their personal copies while a quantity order for the pupils is being considered.

30-day approval—List price $1.75

Net professional price, with key, $1.40

4-29 copies, including keys, $1.23 each, net

30 or more copies, $1.05 net each, keys 8c ea.

INOR PUBLISHING CO., 207 Fourth Ave. New York 3